Detecting changes in essential ecosystem and biodiversity properties- towards a Biosphere Atmosphere Change Index: BACI

Deliverable 2.1: Summary of available archived optical and microwave low-level and derived products

Project title:	Detecting changes in essential ecosystem and biodiversity properties- towards a Biosphere Atmosphere Change Index
Project Acronym:	BACI
Grant Agreement number:	640176
Main pillar:	Industrial Leadership
Topic:	EO- 1- 2014: New ideas for Earth-relevant space applications
Start date of the project:	1st April 2015
Duration of the project:	48 months
Dissemination level:	Confidential
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Date of submission:	31.07.2015

Summary
This deliverable provides a summary of the Earth Observation (EO) data products that fall into four categories:

- Available on CEMS now (as of 2015-07)
- Potentially available via negotiation with other projects using CEMS
- Available for download onto CEMS (as of 2015-07)
- Potentially available via other external projects/collaborators

The datasets are listed, along with the relevant details of source, sensor, spatial and temporal coverage, format etc. Those held on CEDA/ CEMS already are highlighted.

Aim/Outcome
These listings are intended to provide a guide for the BACI consortium on the EO data that are, or may be depending on permissions, made available to the BACI consortium. Various data are available through BACI consortium links to other EU ESA, and nationally funded projects.

Related projects include: at UCL Geography, the Natural Environment Research Council (NERC) National Centre for Earth Obervation (NCEO).

including: QA4ECV: Quality Assurance for Essential Climate Variables (via BACI consortium member and QA4ECV partner UCL); FIDUCEO: Fidelity and Uncertainty in Climate data records from Earth Observations (permission required: via BACI consortium member STFC/CEMS); EUSTACE: EU Surface Temperature for All Corners of Earth (permission required: via BACI consortium member STFC/CEMS).

Acronyms

ARSF	NERC Airborne Research and Survey Facility (http://arsf.nerc.ac.uk/)
CCI	Climate Change Initiative (http://cci.esa.int/)
CEDA	Centre for Environmental Data Archival
CEMS	Climate and Environmental Monitoring from Space
ECV	Essential Climate Variable
EO	Earth Observation
EUFAR	European Facility for Airborne Research (http://www.eufar.net/)
EUSTACE	EU Surface Temperature for All Corners of Earth (see http://ec.europa.eu/rea/pdf/eustace_640171.pdf)
fAPAR	Fraction of Absorbed Photosynthetically Active Radiation
FIDUCEO	Fidelity and Uncertainty in Climate data records from Earth Observations (see http://ec.europa.eu/rea/pdf/fiduceo_638822.pdf and http://www.fiduceo.eu/)
FSU	Friedrich Schiller University
GWS	CEDA/CEMS Group Work Space
JASMIN	Joint Analysis System (Meeting Infrastructure Needs)
LAI	Leaf Area Index
NCEO	UK National Centre for Earth Observation (NERC centre)
NERC	UK Natural and Environment Research Council
QA4ECV	Quality Assurance for Essential Climate Variables (see http://www.qa4ecv.eu/)
STFC	UK Science and Technology Facilities Council
UCL	University College London

1 Summary of data holdings available to BACI on CEDA/CEMS currently, or pending workspace links being set up

The tables below detail data already on CEDA/CEMS, accumulated for a variety of completed or ongoing projects requiring regional or global EO datasets.

1.1 Data available to (and via) UCL Geography (via J. Gomez-Dans, P. Lewis and M. Disney, under various projects including NERC NCEO)

Data set name	Version	Description	Ref/DOI	Geographical coverage	Period	Person responsible	Institution	Data storage location	Data set size	Remark
MODIS.MOD09GA	05	Daily MODIS 500m Surface-Reflectance Product[1]	URL	Global	2000/02..2014/06	J. Gomez-Dans	UCL Geog	CEMS	7Tb	Level 2
MODIS.MYD09GA	05	Surface Reflectance 8-Day L3 Global 500m	URL	Global	2002/06..20014/06	J. Gomez-Dans	UCL Geog	CEMS	6Tb	Level 3
MODIS.MCD45A1	051	MODIS official burned area product	URL	Global	200/02..2014/06	J. Gomez-Dans	UCL Geog	CEMS	86Gb	Level 3
MODIS.MCD64	1	GFED MODIS burned area product	URL	Global	200/02..2014/06	J. Gomez-Dans	UCL Geog	CEMS	86Gb	Level 3
MODIS.MCD12A1	051	MODIS official LandCover product	URL	Global	2005	J. Gomez-Dans	UCL Geog	CEMS	32Gb	Level 3

1 Reduced data set MODHDFSR

1.2 Data available via EU QA4ECV (via Y. Govaerts & J. –P. Muller) and ESA GlobAlbedo (J. –P. Muller, publically available)

These data are acquired/held as part of the EU QA4ECV project, of particular interest for land surface processes and for the ESA GlobAlbedo project (see http://www.globalbedo.org/). Various derived products describing the state of the land surface are also available from the GlobAlbedo project (BRDF, LAI, fAPAR).

Data set name	Version	Description	Ref/DOI	Geographical coverage	Period	Person responsible	Institution	Data storage location	Data set size	Remark
MISR.MIL2ASAE	002	MISR Level 2 Aerosol parameters	URL	global	2000/02..2014/02	S. Kharbouche	mssl-ucl	CEMS	2.4Tb	Level 2
MISR.MIL2ASLS	002	MISR Level 2 Land Surface Data Stage 2 & 3 Validated	URL	global	2000/02..2014/02	S. Kharbouch	mssl-ucl	CEMS	6.4Tb	Level 2
MODIS.MOD09	05	The MODIS Surface-Reflectance Product	URL	global	2000/02..2014/06	S. Kharbouche	mssl-ucl	CEMS	27Tb	Level 2
MODIS.MYD09A1	05	Surface Reflectance 8-Day L3 Global 500m	URL	global	2002/06..2009/12	S. Kharbouche	mssl-ucl	CEMS	9.6Tb	Level 3
MODIS.MYD09	05	MODIS Surface Reflectance Product from the Aqua Satellite	URL	global	2000/06..2014/06	S. Kharbouche	mssl-ucl	CEMS	12Tb	Level 2
MODIS.MOD03	05	Geolocation Data Set (l1b)	URL	global	2000/02..2014/06	S. Kharbouche	mssl-ucl	CEMS	2.3Tb	Level 1b
MODIS.MCD43A1/2	05	BRDF/Albedo Model Parameters Product, 8-daily	URL	global	2000/02..2014/06	S. Kharbouche	mssl-ucl	CEMS	13.5Tb	Level 3
MODIS prior	05	8-daily Spectral & broadband, 500m based on MCD43A1/2	URL	global	46 Days of the year(001, 009,..361)	S. kharbouche	mssl-ucl	CEMS	15Tb	Level 4
MODIS.MOD09	06	The MODIS Surface-Reflectance Daily Product	URL	global	2000/02..??	S. kharbouche	mssl-ucl	CEMS	~350Tb	Level 2 (in progress)
MODIS.MCDA1/2	06	BRDF/Albedo Model Parameters	URL	global	2000/02..??	S. kharbouche	mssl-ucl	CEMS	~25Tb	Level 3 (in

		Product, 1-daily								progress)
LTDR	03	Land Long Term Data Record (AVHRR and MODIS)	URL	global	2000/02..2014/12	S. kharbouche	mssl-ucl	CEMS	11Tb	Level 2
VGT_l1p		VEGETATION-1/2, P product	URL	global	1998/04..2014/12	G. Watson	mssl-ucl	CEMS	11.3Tb	Level p
MERIS_l1b	03	calibrated radiances at the Top Of Atmosphere	URL	global	2002/04..2012/04	S. Kharbouche	mssl-ucl	CEMS	25Tb	Level 1b
(A)ATSR	2.1	(A)ATSR Multimission Archives Version 2.1 Land and Sea Surface Data	URL	global	1998/04..2014/12	S. Kharbouche	mssl-ucl	CEDA (connected to CEMS)	~25Tb	Level 2
GlobAlbedo	1	Global land surface visible, NIR and total shortwave albedo derived from combined ESA and NASA EO data.	URL	global	1998/2011	S. Kharbouche	mssl-ucl	CEDA (connected to CEMS)	~1TB	Level 2
GlobAlbedo BRDF	1	Spectral BRDF i.e. directional ratio of reflected spectral radiance ($Wm^{-2}sr^{-1}nm^{-1}$)	URL	global	1998/2011	S. Kharbouche	mssl-ucl	CEDA (connected to CEMS)	~1TB	Level 2
GlobAlbedo LAI, fAPAR	1	Derived from 2-stream RT model fitted to GlobAlbedo albedo data.	URL	global	1998/2011	S. Kharbouche	mssl-ucl	CEDA (connected to CEMS)	~1TB	Level 2

2 Summary of data holdings available on CEDA/CEMS currently, via other ongoing EU-funded projects, summarised by BACI partner STFC

These data are held on CEDA/CEMS as part of a number of onfoing EU projects and are managed/collated by BACI partner STFC for these projects. STFC are providing the same role for BACI, and as a consequence are able to provide a manifest of the data held or managed under the auspices of these projects. STFC will act as liaison, helping BACI to negotiate permission to use these data on a case-by-case basis. Note that included here are in situ observations, not just EO. These are included here as they are very often used in conjunction with the EO data.

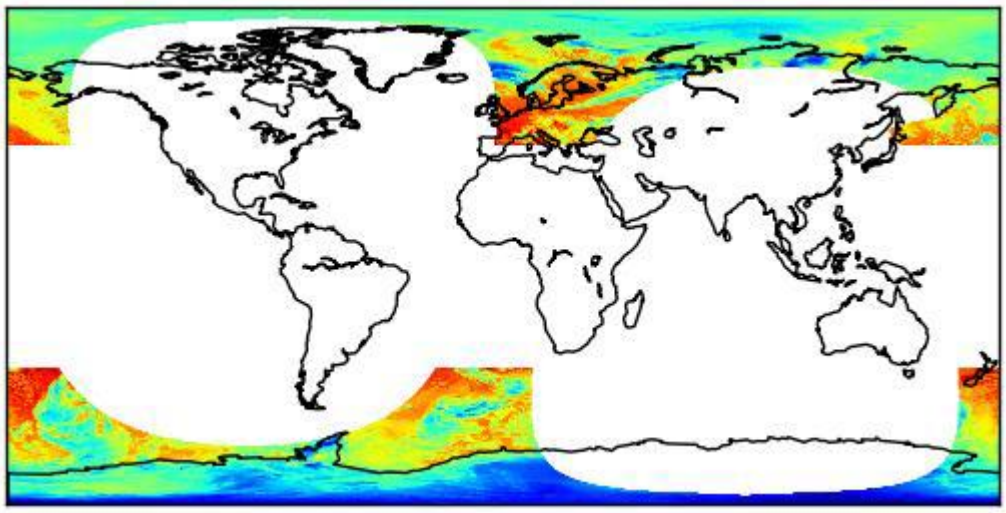
2.1 EUSTACE Project

Permission for sharing any of these data will need to sought on a case by case basis. A summary of the datasets follows, with more detailed descriptions in each case, below:

2.1.1 EUSTACE Project: EO data

- LAND SURFACE SKIN TEMPERATURE DATA SETS FROM GLOBTEMPERATURE (ULEIC; INCLUDES LSA-SAF AND NASA DATA SETS)
    i) Aqua-MODIS Level-2 LST (GT_MYD_2P)
    ii) Satellite LST and Auxiliary (AUX) data derived from Aqua-MODIS
    iii) SEVIRI Level-2 LST (GT_SEV_2P)
- SATELLITE SEA SURFACE TEMPERATURES FROM SST CCI (UREAD)
- SATELLITE LAKE SURFACE WATER TEMPERATURE OBSERVATIONS (AND ANCILLARY DATA) FROM ARC-LAKE/GLOBOLAKES (UREAD) AND INLAND WATER TEMPERATURE (IWT) FROM THE GLOBAL LAKE TEMPERATURE COLLABORATION (GLTC)
    i) ARCLAKE

DETAILED INFORMATION FOR SATELLITE DATA SETS:

Product name	**Arctic and Antarctic ice Surface Temperatures from thermal Infrared satellite sensors (AASTI)**
Data description	The observations are Level 2 satellite ice and sea surface temperature observations from 11 NOAA AVHRR sensors, (NOAA 7,9,11,12,14,15,16,17,18,Metop02,19)
Source	The data set has been produced by DMI and Met.no, as part of the NAClim project, and is based upon the level 1 data set compiled by EUMETSAT's Climate Monitoring, Satellite Application Facility. Contact jlh@dmi.dk or gd@dmi.dk for further information on the data set
Key Websites	Naclim website is : http://www.naclim.eu/
Version	1.0
References to technical specifications documents	NACLIM Deliverable D32.28 Report on the documentation and description of the new Arctic Ocean dataset combining SST and IST Contact jlh@dmi.dk or gd@dmi.dk for further information. This data is not available online due to large data volumes.
Product format	NetCDF 3, CF1.4 compliant
Data gridding and resolution	The data set is Global Area Coverage (GAC) data in approximately 5 km resolution
Data coverage: temporal	1982 to 2009 See comments box below for details on extension of this data
Data coverage: spatial	AASTI covers only the regions north of 40 degree north and south of 40 degree south, the figure below shows an example for 1 GAC swath 
Third party redistribution .	The data are freely available to third parties
Availability of regular upgrades, update cycle	An update of this product to version 1.1 is expected when the level 1 brightness temperature from climate SAF have been updated within approximately 6 month, Regular updates on e.g. a yearly basis depends upon funding. No funding is available at the moment but it is being sought.
Alternative data sources	The operational ice surface temperature products from OSI-SAF (see description below) will be processed and used in EUSTACE. In addition, the operational Modis and VIIRS IST are available, which may be used for referencing at specific times if necessary.
Comments	Version 1.0 contains calibration errors in about 30 % of the orbits from NOAA 7 to 14, due to erroneous calibration correction in the CLARA data set. This will be fixed within the Climate SAF and a new version will be ready within 6 months. This version also includes a temporal extension to 2014, which closes the current gap with Metop_A IST observations

Product name	**Metop A operational Ice Surface Temperatures**
Data description	This surface temperature product is an integrated IST, SST and MIZ temperature product based on METOP AVHRR IR level 2 swath data. Swath data width is approximately 2000km in approximately 1km resolution. The data are provided in 3 minutes segments and is processed as such and the product is delivered in the same 3 minutes swath projection. The data includes the fields: • **ic**: Ice concentration • **st**: Ice and sea surface temperatures • **cm_flag**: Cloud mask and algorithm flag • **lat**:Latitude • **lon**:Longitude • **time**: time • **sza**: Sun-Zenith angle
Source	The data set have been produced by DMI under the Myocean project, but a transition is currently taking place, to include it as an official OSI-SAF product.
Key Websites	http://osisaf.met.no/
Version	1.0
References to technical specifications documents	The product is documented in the Myocean Product User Manual for Ice Surface Temperature Reference: MYO-WP14-SIW-DMI-ARC-SEAICE_TEMP-OBS-PUM Contact jlh@dmi.dk or gd@dmi.dk for further information.
Product format	NetCDF3, CF compliant
Data gridding and resolution	Spatial resolution is 1 km
Data coverage: temporal	From January 2013 to present
Data coverage: spatial	North of 60 deg N
Third party redistribution.	The data are freely available to third parties
Availability of regular upgrades, update cycle	Production will continue without gaps within the OSI-SAF.
Alternative data sources	The operational Modis and VIIRS IST are available.
Comments	A global extension will be implemented within 6 months to include Antarctic observations. The southern hemisphere IST will be rerun from January 1st 2015.

Product name	**Aqua-MODIS Level-2 LST (GT_MYD_2P)**
Data description	Satellite LST and Auxiliary (AUX) data derived from Aqua-MODIS
Source	GlobTemperature product derived from the operational MYD11 observations distributed by the NASA Land Processes Distributed Active Archive Center (LP DAAC)
Key Websites	https://lpdaac.usgs.gov/products/modis_products_table http://data.globtemperature.info/
Version	GlobTemperature v1.0
References to technical specifications documents	Wan, Z. (1999). MODIS Land-Surface Temperature Algorithm Theoretical Basis Document (LST ATBD) Version 3.3. *NASA Report* Wan, Z. (2008). New refinements and validation of the MODIS land surface temperature/emissivity products. *Remote Sensing of Environment, 112*, 59– 74 Wan, Z., & Li, Z.L. (2008). Radiance-based validation of the V5 MODIS land-surface temperature product. *International Journal of Remote Sensing, 29*, 5373-5395

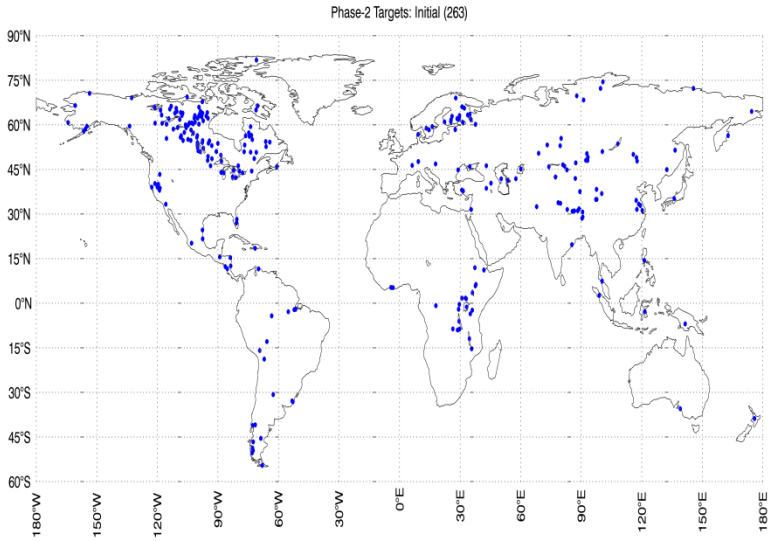
Product format	NetCDF v4.1.3
Data gridding and resolution	1 km swath data in 5-minute granules
Data coverage: temporal	2002 to present(timeliness of new updates is 1 month)
Data coverage: spatial	Global
Third party redistribution.	No restrictions on use or redistribution
Availability of regular upgrades, update cycle	Yearly updates to the product expected
Alternative data sources	If required the GlobTemperature Terra-MODIS product can also be made available
Comments	The mandatory LST data are stored in datafiles labelled "LST" with accompanying auxiliary data stored in datafiles labelled "AUX"

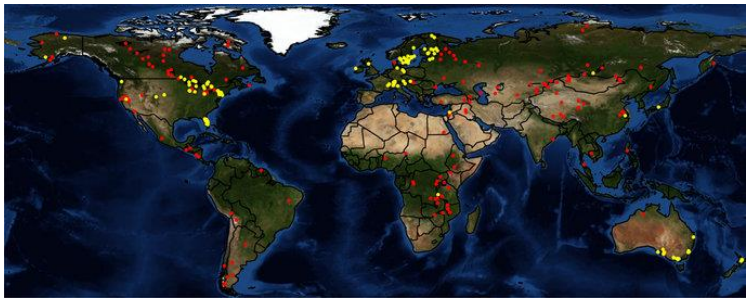
Product name	**SEVIRI Level-2 LST (GT_SEV_2P)**
Data description	Satellite LST data derived from MSG-SEVIRI
Source	GlobTemperature product derived from the EUMETSAT Land Surface Analysis SAF Product LSA-001
Key Websites	http://data.globtemperature.info/ http://landsaf.meteo.pt/
Version	GlobTemperature v1.0
References to technical specifications documents	http://www.eumetsat.int/website/home/Satellites/CurrentSatellites/Meteosat/MeteosatDesign/index.html Trigo, I., Freitas, S., Bioucas-Dias, J., Barroso, C., Monteiro, I., and Viterbo, P. (1999). SEVIRI Algorithm Theoretical Basis Document for Land Surface Temperature Issue 1.0. *LSA SAF Report* Trigo, I.F., Monteiro, I.T., Olesen, F., & Kabsch, E. (2008). An assessment of remotely sensed land surface temperature. *Journal of Geophysical Research-Atmospheres, 113*
Product format	NetCDF v4.3.1.1
Data gridding and resolution	0.05° x 0.05° equal-angle latitude-longitude gridded data for entire SEVIRI disk at hourly resolution
Data coverage: temporal	2007 to 2013 (timeliness of new updates is 1 month)
Data coverage: spatial	SEVIRI disk – Africa, Europe, part of S. America
Third party redistribution.	LSA SAF product (LSA-001) Background Intellectual Property Rights are applicable. The LSA-002 product is considered "essential" in accordance with the WMO Resolution 40 (Cg-XII). This means that access to these SAF products is granted to all users without a licence, without charge and they may not be redistributed without transformation, as stated in the Basic Principles of EUMETSAT Data Policy (http://www.eumetsat.int/website/wcm/idc/idcplg?IdcService=GET_FILE&dDocName=PDF_LEG_DATA_POLICY&RevisionSelectionMethod=LatestReleased&Rendition=Web)
Availability of regular upgrades, update cycle	Yearly updates to the product expected
Alternative data sources	Full temporal (15 minute) and spatial resolution data are available from the LSA SAF website: http://landsaf.ipma.pt
Comments	The hourly LST data derived from SEVIRI/Meteosat and available from GlobTemperature is entirely based on the LST product generated within the EUMETSAT Satellite Applications Facility on Land Surface Analysis (LSA SAF product LSA-001)

Product name	ESA SST CCI Analysis Long-term product

Data description	Interpolated (gap-filled) daily sea surface temperature
Source	European Space Agency Climate Change Initiative Sea Surface Temperature (SST CCI)
Key Websites	http://dx.doi.org/10.5285/878bef44-d32a-40cd-a02d-49b6286f0ea4 http://cci.esa.int http://badc.nerc.ac.uk/browse/neodc/esacci_sst
Version	v1.0
References to technical specifications documents	Merchant, C. J., Embury, O., Roberts-Jones, J., Fiedler, E., Bulgin, C. E., Corlett, G. K., Good, S., McLaren, A., Rayner, N., Morak-Bozzo, S. and Donlon, C. (2014), Sea surface temperature datasets for climate applications from Phase 1 of the European Space Agency Climate Change Initiative (SST CCI). Geoscience Data Journal. doi: 10.1002/gdj3.20 http://www.esa-sst-cci.org/sites/default/files/Documents/public/SST_CCI-PUG-UKMO-001_Issue-3-signed-accepted.pdf
Product format	NetCDF
Data gridding and resolution	0.05° x 0.05° equal-angle latitude-longitude gird
Data coverage: temporal	1991 to 2010
Data coverage: spatial	Global
Third party redistribution.	Access to ESA CCI SST data are available under a Creative Commons Licence by attribution, which means users may: **Share** — copy and redistribute the material in any medium or format: **Adapt** — remix, transform, and build upon the material; for any purpose, even commercially. This is conditional on appropriate attribution and providing a link to the license.
Availability of regular upgrades, update cycle	Next update in 2017
Alternative data sources	HadISST
Comments	The analysis takes as input satellite data only, from AVHRRs and ATSRs, processed by SST CCI techniques.

Product name	**ARCLAKE**
Data description	Satellite LSWT data derived from ATSR-2 and AATSR imagery for 263 large lakes
Source	University of Reading / University of Edinburgh
Key Websites	http://www.geos.ed.ac.uk/arclake
Version	2.0
References to technical specifications documents	http://www.geos.ed.ac.uk/arclake/ARC-Lake-Technical-Note-1-lake-selection_v1.0.pdf MacCallum, S.N., and Merchant, C.J. (2012). Surface water temperature observations of large lakes by optimal estimation. Can. J. Remote Sensing, 38(1), 25-45.
Product format	netCDF
Data gridding and resolution	0.05 degree grid/Lake-mean
Data coverage: temporal	1991 to 2011

Data coverage: spatial	The locations of the 263 lakes is shown below 
Third party redistribution.	ODC Attribution License (ODC-By) [A plain language summary of the Open Database License](http://www.opendatacommons.org/licenses/by/summary/) is available.
Availability of regular upgrades, update cycle	There is also a v.3.0 of ARCLAKE ARCLAKE likely to be superseded by update from NERC GloboLakes
Alternative data sources	ARCLAKE v3.0
Comments	None

Product name	**Global Lake Temperature Collaboration (GLTC) data records**
Data description	Collation of long-term LSWT measurements from 291 lakes from satellite and in situ data. Satellite data were measured by the Advanced Very High Resolution Radiometer (AVHRR) series and the Along Track Scanning Radiometer (ATSR-1, ATSR-2, Advanced ATSR) series. In situ data were measured by various instruments, details of which are given by Sharma et al. (2015).
Source	The data set has been produced by phase 1 of the GLTC.
Key Websites	http://www.laketemperature.org/
Version	1.0
References to technical specifications documents	Sharma et al. (2015). A global database of lake surface temperatures collected by in situ and satellite methods from 1985-2009. Scientific Data 2, 150008.
Product format	comma delimited text files, R package ‘laketemps’
Data gridding and resolution	Data provided are summer-time (June, August, September for Northern Hemisphere; January, February, March for Southern Hemisphere) averages from both satellite and in situ measurements. Satellite data is only included for lakes that exhibited at least a 10 x 10 km area of pure water surface without any islands or shorelines.
Data coverage: temporal	1985 to 2009
Data coverage: spatial	Yellow – in situ sampled lakes; Red – satellite sampled lakes 

Third party redistribution.	The data policy is here http://www.lternet.edu/policies/data-access This states: “Redistribution. The data are provided for use by the Data User. The metadata and this license must accompany all copies made and be available to all users of this Data Set. The Data User will not redistribute the original Data Set beyond this collaboration sphere.”
Availability of regular upgrades, update cycle	The data will be updated during phase 2 of the GLTC. Phase 2 aims to include more lakes, longer time series of in situ data, and depth-resolved measurements.
Alternative data sources	None
Comments	None

2.1.2 EUSTACE Project: in situ data

IN SITU OBSERVATIONS:

- LAND AND AIR TEMPERATURE DATA FROM SPECIFIC SITES (E.G. ARM, USCRN, BSRN) (ULEIC) AND LSA-SAF SITES IN AFRICA & PORTUGAL) (MET OFFICE)
    i) ARM in situ measurements
    ii) USCRN in situ measurements
    iii) BSRN in situ measurements
    iv) KIT/Land Surface Analysis Satellite Applications Facility ground station observations
- LAND SURFACE AIR TEMPERATURE MEASUREMENTS SUCH AS ECA&D AND GHCN-D (UBERN/KNMI)
    i) European Climate Assessment & Dataset (ECA&D)
    ii) Global Historical Climatology Network – Daily (GHCN-D)
- IN SITU LAKE SURFACE WATER TEMPERATURE MEASUREMENTS THROUGH ASSOCIATES OF GLOBOLAKES AND THE GLOBAL LAKE TEMPERATURE COLLABORATION (GLTC, UREAD)
    i) Global Lake Temperature Collaboration (GLTC) data records

DETAILED INFORMATION FOR IN SITU DATA SETS

Product name	**ARM in situ measurements**
Data description	In situ LST, air temperature and additional meteorological data measured at the Atmospheric Radiation Measurement (ARM) Climate Research Facility sites
Source	U.S. Department of Energy (DOE)
Key Websites	https://www.arm.gov/
Version	Version numbering is variable and site specific
References to technical specifications documents	http://www.arm.gov/publications/handbooks Mather, J.H., & Voyles, J.W. (2012). The ARM Climate Research Facility: A Review of Structure and Capabilities. *Bulletin of the American Meteorological Society, 94*, 377-392
Product format	NetCDF
Data gridding and resolution	Point data averaged every 60 seconds
Data coverage: temporal	1995 to present
Data coverage: spatial	Three primary locations: Southern Great Plains, North Slope of Alaska, Eastern North Atlantic Mobile facilities anywhere in the world Archive data from fixed locations in Tropical Western Pacific
Third party redistribution.	Free and open access to data; some sources restrict secondary distribution of data (see full data policy: http://www.arm.gov/data/docs/policy) The U.S. Department of Energy ARM Climate Research Facility should be acknowledged in publications as the programmatic origin of the field program
Availability of regular upgrades, update cycle	Not known
Alternative data sources	N/A
Comments	Data from the ARM network to be used for WP3 validation are independent of that to be used in WP1 relationship building

Product name	**USCRN in situ measurements**
Data description	In situ LST, air temperature and additional meteorological data measured at the US Climate Research Network (USCRN) sites
Source	National Climatic Data Center, NESDIS, NOAA, U.S. Department of Commerce
Key Websites	http://www.ncdc.noaa.gov/crn/
Version	N/A
References to technical specifications documents	http://www.ncdc.noaa.gov/crn/instrdoc.html Howard J. Diamond, Thomas R. Karl, Michael A. Palecki, C. Bruce Baker, Jesse E. Bell, Ronald D. Leeper, David R. Easterling, Jay H. Lawrimore, Tilden P. Meyers, Michael R. Helfert, Grant Goodge, and Peter W. Thorne, 2013: U.S. Climate Reference Network after One Decade of Operations: Status and Assessment. *Bull. Amer. Meteor. Soc.*, **94**, 485–498
Product format	ASCII
Data gridding and resolution	Point data averaged every 300 seconds
Data coverage: temporal	2006 to present for sub-hourly data
Data coverage: spatial	114 sites across the conterminous 48 states, with 16 additional sites in Alaska and 2 sites in Hawaii
Third party redistribution.	Users who redistribute or use USCRN data to create products and conduct analyses are asked to cite NCDC and the USCRN program as the source of the data (see full data policy: http://www1.ncdc.noaa.gov/pub/data/uscrn/documentation/program/USCRN_Data_Management_Plan-September_2012.pdf) USCRN Program requests that users of USCRN data reference the following journal articles: Howard J. Diamond, Thomas R. Karl, Michael A. Palecki, C. Bruce Baker, Jesse E. Bell, Ronald D. Leeper, David R. Easterling, Jay H. Lawrimore, Tilden P. Meyers, Michael R. Helfert, Grant Goodge, and Peter W. Thorne, 2013: U.S. Climate Reference Network after One Decade of Operations: Status and Assessment. *Bull. Amer. Meteor. Soc.*, **94**, 485–498. doi, http://dx.doi.org/10.1175/BAMS-D-12-00170.1 Or, if emphasizing soil moisture/temperature data: Bell, J.E., M.A. Palecki, C.B. Baker, W.G. Collins, J.H. Lawrimore, R.D. Leeper, M.E. Hall, J. Kochendorfer, T.P. Meyers, T. Wilson, and H.J. Diamond. 2013: U.S. Climate Reference Network Soil Moisture and Temperature Observations. J. Hydrometeorol., doi: 10.1175/JHM-D-12-0146.1
Availability of regular upgrades, update cycle	Not known
Alternative data sources	N/A
Comments	Data from the USCRN to be used for WP3 validation are independent of that to be used in WP1 relationship building

Product name	**BSRN in situ measurements**
Data description	In situ air temperature and additional meteorological data measured at the Baseline Surface Radiation Network (BSRN) sites
Source	World Radiation Monitoring Center (WRMC)
Key Websites	http://www.bsrn.awi.de/
Version	Version 1.0
References to technical specifications documents	Ohmura, A., E. G. Dutton, B. Forgan and 12 co-authors, 1998: Baseline Surface Radiation Network (BSRN)/WCRP): New precision radiometry for climate research. Bull. Amer. Meteoro. Soc. 79, 2115- 2136
Product format	ASCII (Station-to-archive format)
Data gridding and resolution	Point data averaged every 60 seconds
Data coverage: temporal	1992 to present for sub-hourly data

Data coverage: spatial	64 sites located around the world
Third party redistribution.	BSRN data is freely available to users for research purposes. Use of a particular station's data and the World Radiation Monitoring Center (WRMC) must always be explicitly acknowledged BSRN data sets provided by the WRMC must not be passed to a third party without the agreement of the WRMC
Availability of regular upgrades, update cycle	Not known
Alternative data sources	N/A
Comments	Data from the BSRN to be used for WP3 validation are independent of that to be used in WP1 relationship building

Product name	**KIT/Land Surface Analysis Satellite Applications Facility ground station observations**
Data description	In situ station observations of land surface temperature (LST), 2 m temperature and moisture, wind speed (2-3 m and 20-25 m height), long- and short-wave radiation (up- and down-welling radiation).
Source	Karlsruhe Institute of Technology and University of Copenhagen (Dahra Met data only)
Key Websites	http://www.imk-asf.kit.edu/english/MSA-Validiation.php
Version	Not applicable
References to technical specifications documents	Gottsche et al., 2013, 'Validation of land surface temperature derived from MSG/SEVIRI with in situ measurements at Gobabeb, Namibia', IJRS, DOI: 10.1080/01431161.2012.716539
Product format	Ascii
Data gridding and resolution	Point observations at 1-minute intervals.
Data coverage: temporal	2005 – present (Evora, Portugal), 2007- present (Gobabeb, Namibia and Dahra, Senegal), 2009 – present (Kalahari, Namibia).
Data coverage: spatial	Evora (Portugal), Farm RMZ and Heimat (Kalahari, Namibia), Gobabeb (Namib Desert) and Dahra (Senegal).
Third party redistribution.	Not permitted.
Availability of regular upgrades, update cycle	Ongoing data collection confirmed until 2017; negotiations to continue to 2022 are currently underway. The data are updated daily in theory, but in practise there may be some delays owing to power failures, network problems, etc. Requests for new/updated data must be made to KIT/Uni. Copenhagen.
Alternative data sources	None available.
Comments	Data from the Dahra station have significant gaps owing to vandalism and theft. Meterological data for the Dahra station will be provided by the University of Copenhagen. Contacts: Folke Olseen (folke.olesen@kit.edu; KIT), Rasmus Fensholt (rf@ign.ku.dk; Uni. Copenhagen).

Product name	**HadIOD (Hadley Centre Integrated Ocean Database)**
Data description	In situ water temperature, with uncertainty estimates and bias adjustments
Source	Met Office Hadley Centre.
Key Websites	http://onlinelibrary.wiley.com/wol1/doi/10.1002/2014JC010053/abstract
Version	1.1.0.0
References to technical specifications documents	http://onlinelibrary.wiley.com/wol1/doi/10.1002/2014JC010053/abstract

Product format	Format is plain ascii, file format description is provided in the data directory
Data gridding and resolution	Data are point observations
Data coverage: temporal	1850-2014
Data coverage: spatial	All ocean areas
Third party redistribution.	No
Availability of regular upgrades, update cycle	Product is updated once per year.
Alternative data sources	ICOADS Real Time updates could provide near-surface water temperature
Comments	Other comments.

Product name	**HadNMAT2**
Data description	In situ air temperature measurements, corrected to a reference height of 10m
Source	National Oceanography Centre and Met Office Hadley Centre
Key Websites	http://www.metoffice.gov.uk/hadobs/hadnmat2/
Version	v.2.0.0.0
References to technical specifications documents	http://www.metoffice.gov.uk/hadobs/hadnmat2/
Product format	ascii
Data gridding and resolution	Data are point observations of air temperature
Data coverage: temporal	1856--2010
Data coverage: spatial	All ocean areas
Third party redistribution.	The data should be publicly available by the end of the project so redistribution would be unnecessary.
Availability of regular upgrades, update cycle	Air temperature measurements can be obtained from ICOADS real time updates. The data would need to be adjusted to a reference height.
Alternative data sources	n/a
Comments	

Product name	**IST radiometric surface temperatures from infrared radiometers**
Data description	ISAR and Cambell Scientific IR120) obtained during field campaigns to Greenland The campaigns and instruments are listed below include: • March/April 2011, Qaanaaq, Greenland: (ISAR and IR 120) • March/April 2012, Qaanaaq, Greenland: (IR 120 only) • March/April 2013, Qaanaaq Greenland : (ISAR + IR120) • March/April 2014, Qaanaaq Greenland: (IR 120) • January-April 2015, Qaanaaq Greenland, (IR 120 + AWS)
Source	All data have been acquired by DMI
Key Websites	
Version	
References to technical specifications documents	A data report from the 2011 experiment can be found at: http://www.dmi.dk/fileadmin/Rapporter/TR/tr11-18.pdf
Product format	All radiometer data are in ascii including information in the header

Data gridding and resolution	Point observations.
Data coverage: temporal	From 2011 to 2015. Field campaigns are typically carried out in 1-2 weeks in Late March and beginning of April. An AWS with an IR 120 was put out in January 2015, providing 10 minutes observations of T2m and Tskin until (at least) April 2015.
Data coverage: spatial	Inglefield Bredning, Greenland, about 77.45 N, -69.21 W
Third party redistribution.	Data can be used by the partners in EUSTACE
Availability of regular upgrades, update cycle	2-3 field campaigns with radiometers are planned every year for the next 3 years
Alternative data sources	
Comments	A data rescue task in WP3 will provide additional SIST in situ observations from historical data sets and research campaigns.

Product name	**European Climate Assessment & Dataset (ECA&D)**
Data description	In situ data, daily average temperature, daily maximum temperature, daily minimum temperature. The data comes is two flavours. One are the "non blended" data, which is the data as close as possible to what the European Meteorological Services have contributed. The other is the "blended" data, to which a gap-filling procedure has been applied and data from the GTS is used to update the series to a date as recent as possible.
Source	The ECA&D is compiled by KNMI and is a joint effort of National Meteorological and Hydrological Services and other data holding institutions in Europe and the Mediterranean
Key Websites	http://www.ecad.eu
Version	Version updated to Feb. 28 2015
References to technical specifications documents	http://www.ecad.eu/documents/atbd.pdf Klein Tank et al. (2002) Daily dataset of 20th-century surface air temperature and precipitation series for the European Climate Assessment, Intern. J. Climatol. 22:1441-1453
Product format	ASCII
Data gridding and resolution	Station data
Data coverage: temporal	daily
Data coverage: spatial	Data contained for Europe (incl. Greenland), the Middle East and North Africa.
Third party redistribution.	Data is available on CEMS and can be used by the partners in EUSTACE
Availability of regular upgrades, update cycle	Updated twice a year. EUSTACE will not use there updates. ECA&D dataset is extended forward in time every month.
Alternative data sources	-
Comments	More detailed metadata on the station (like relocations and instrument use) are available for a subset of the stations. This information includes a picture of the station, description of the land use and a link to Google Maps to give an impression of its surroundings. This information is accessible only through the ECA&D webpages at http://www.ecad.eu. For a station with ECA station id NNNN, the information can be access via: http://www.ecad.eu/utils/stationdetail.php?stationid=NNNN The ECA station identifiers are used in the file: stations.txt and in the data files.

Product name	**Global Historical Climatology Network – Daily (GHCN-D)**
Data description	In situ data, daily maximum temperature, daily minimum temperature, precipitation, snow fall and snow depth.
Source	The GHCN-D data set is compiled by NCDC/NOAA

Key Websites	ftp://ftp.ncdc.noaa.gov/pub/data/ghcn/daily/
Version	Version 3.20
References to technical specifications documents	The journal article describing GHCN-Daily is: Menne, M.J., I. Durre, R.S. Vose, B.E. Gleason, and T.G. Houston, 2012: An overview of the Global Historical Climatology Network-Daily Database. Journal of Atmospheric and Oceanic Technology, 29, 897-910, doi:10.1175/JTECH-D-11-00103.1. To acknowledge the specific version of the dataset used, please cite: Menne, M.J., I. Durre, B. Korzeniewski, S. McNeal, K. Thomas, X. Yin, S. Anthony, R. Ray, R.S. Vose, B.E.Gleason, and T.G. Houston, 2012: Global Historical Climatology Network -Daily (GHCN-Daily), Version 3.20 NOAA National Climatic Data Center. http://doi.org/10.7289/V5D21VHZ [April 2015].
Product format	ASCII
Data gridding and resolution	Station data
Data coverage: temporal	daily
Data coverage: spatial	Global
Third party redistribution.	Open for non-commercial research and education.
Availability of regular upgrades, update cycle	-
Alternative data sources	-
Comments	-

2.1.3 EUSTACE Project: Ancillary data

ANCILLARY DATA:

- ERA INTERIM AND 20CR (MET OFFICE)
  - i) ERA-Interim
  - ii) 20th Century Reanalysis
- ELEVATION, VEGETATION (ULEIC) AND LAND USE (MET OFFICE)
  - i) Level-3 DEM data
  - ii) Level-3 FCOVER data
  - iii) ESA CCI Land Cover Map
- SNOW COVER FROM THE GLOBSNOW PROJECT (MET OFFICE)
  - i) CryoClim Snow cover
- EXISTING CLIMATOLOGIES FOR LAND, OCEANS, ICE areas (Met Office)
  - i) CRU CL v2.0
  - ii) MyOcean OSTIA reanalysis
  - iii) HadSST2 climatology
  - iv) HadNMAT2 climatology
- Lake area, depth information (GloboLakes / UREAD)

DETAILED INFORMATION FOR ANCILLARY DATA SETS

Product name	**Level-3 DEM data**
Data description	Down-sampled version of Digital Elevation Model (DEM) data from the Shuttle Radar Topography Mission (SRTM)
Source	National Aeronautics and Space Administration (NASA) and the National Geospatial-Intelligence Agency (NGA)
Key Websites	https://lta.cr.usgs.gov/SRTM http://www2.jpl.nasa.gov/srtm/index.html
Version	Version 1.0
References to technical specifications documents	Farr, T.G., M. Kobrick, 2000, Shuttle Radar Topography Mission produces a wealth of data, Amer. Geophys. Union Eos, v. 81, p. 583-585. Rodriguez, E., C.S. Morris, J.E. Belz, E.C. Chapin, J.M. Martin, W. Daffer, S. Hensley, 2005, An assessment of the SRTM topographic products, Technical Report JPL D-31639, Jet Propulsion Laboratory, Pasadena, California, 143 pp
Product format	NetCDF v4.1.3
Data gridding and resolution	1/120° equal-angle latitude-longitude gridded data
Data coverage: temporal	N/A
Data coverage: spatial	Global
Third party redistribution.	No restrictions on use or redistribution
Availability of regular upgrades, update cycle	Unknown
Alternative data sources	N/A
Comments	The product is derived from STRM full resolution, 3 arc-sec data but down-sampled to 30 arc-sec (~ 1km)

Product name	**Level-3 FCOVER data**
Data description	Satellite-derived fractional vegetation cover (FCOVER) data from SPOT-VGT and PROBA-V

Source	GlobTemperature product derived from the Copernicus Global Land Service FCOVER product
Key Websites	http://land.copernicus.eu/global/products/fcover
Version	FCOVER v1.0
References to technical specifications documents	Baret, F., Weiss, M., Lacaze, R., Camacho, F., Makhmara, H., Pacholcyzk, P., & Smets, B. (2013). GEOV1: LAI and FAPAR essential climate variables and FCOVER global time series capitalizing over existing products. Part1: Principles of development and production. Remote Sensing of Environment, 137, 299-309 Camacho, F., Cernicharo, J., Lacaze, R., Baret, F., & Weiss, M. (2013). GEOV1: LAI, FAPAR essential climate variables and FCOVER global time series capitalizing over existing products. Part 2: Validation and intercomparison with reference products. Remote Sensing of Environment, 137, 310-329
Product format	NetCDF v4.1.3
Data gridding and resolution	1/112° equal-angle latitude-longitude gridded data (10-day composites)
Data coverage: temporal	1999 to 2012
Data coverage: spatial	Global
½Third party redistribution.	Free and open access as defined under article 8 GMES data and information policy of the GIO regulation and the Copernicus data policy regulation No 1159/2013.
Availability of regular upgrades, update cycle	Version 2.0 expected Q3 2015
Alternative data sources	To be extended to present with a timeliness of 3 days from end of synthesis period, within the framework of Sentinel 3. Until then, climatology data can be used.
Comments	GlobTemperature product derived from the Copernicus Global Land Service FCOVER product whereby 10-day composites are created from the source input data and climatology where no data exists

Product name	**MyOcean OSTIA reanalysis**
Data description	Analysed sea surface temperature (L4) and sea ice fraction
Source	The climatology was provided with the SST CCI tools, but its an average based on the MyOcean OSTIA reanalysis
Key Websites	http://www.myocean.eu/web/69-myocean-interactive-catalogue.php?option=com_csw&view=details&product_id=SST_GLO_SST_L4_REP_OBSERVATIONS_010_011
Version	Version 1
References to technical specifications documents	http://journals.ametsoc.org/doi/abs/10.1175/JCLI-D-11-00648.1
Product format	NetCDF
Data gridding and resolution	Daily, 0.05deg.x 0.05deg.
Data coverage: temporal	1985-2007
Data coverage: spatial	All ocean areas
Third party redistribution.	No, but data are publicly available
Availability of regular upgrades, update cycle	Climatology is static and needs no updates
Alternative data sources	n/a
Comments	

Product name	**HadSST2climatology**

Data description	In situ SST
Source	Met Office Hadley Centre
Key Websites	http://www.metoffice.gov.uk/hadobs/hadsst2
Version	2
References to technical specifications documents	http://www.metoffice.gov.uk/hadobs/hadsst2
Product format	NetCDF
Data gridding and resolution	5-day 1 degree by 1 degree
Data coverage: temporal	1961-1990 climatology
Data coverage: spatial	All ocean areas not covered by ice shelves
Third party redistribution.	No, climatology is publicly available already
Availability of regular upgrades, update cycle	Climatology is static and needs no update
Alternative data sources	n/a
Comments	

Product name	**HadNMAT2 climatology**
Data description	In situ .
Source	Met Office Hadley Centre
Key Websites	http://www.metoffice.gov.uk/hadobs/hadnmat2/
Version	2.0.0.0
References to technical specifications documents	http://www.metoffice.gov.uk/hadobs/hadnmat2/
Product format	NetCDF.
Data gridding and resolution	5-day 1 degree by 1 degree.
Data coverage: temporal	1961-1990 climatology.
Data coverage: spatial	All ocean areas.
Third party redistribution.	No, climatology is publicly available
Availability of regular upgrades, update cycle	Climatology is static and needs no update
Alternative data sources	n/a
Comments	

Product name	**CRU CL v2.0**
Data description	In situ based interpolated climatologies of mean temperature and diurnal temperature range, relative humidity, sunshine, ground frost, 10m windspeed, wet days, precipitation, elevation
Source	The Climatic Research Unit at the University of East Anglia.
Key Websites	http://www.cru.uea.ac.uk/cru/data/hrg/tmc/
Version	2.0
References to technical specifications documents	New et al. 2002 http://www.int-res.com/abstracts/cr/v21/n1/p1-25/

Product format	Ascii
Data gridding and resolution	Monthly 10 arc minute resolution.
Data coverage: temporal	Data are a climatogy for 1961-1990
Data coverage: spatial	Land areas except Antarctica.
Third party redistribution.	No, but data are publicly available from CRU
Availability of regular upgrades, update cycle	Climatology is static and not in need of updates
Alternative data sources	n/a
Comments	Other comments.

Product name	**ERA-Interim**
Data description	Reanalysis data set with separate products for: Surface analysis, Pressure level analysis, Model level analysis, Isentropic level analysis, Potential vorticity level analysis, Surface daily forecast, Pressure level daily forecast, Model level daily forecast
Source	European Centre for Medium-Range Weather Forecasts (ECMWF)
Key Websites	http://www.ecmwf.int/en/research/climate-reanalysis/era-interim
Version	Version 1
References to technical specifications documents	Berrisford et al., 2011, 'The ERA-Interim archive V2.0', ECMWF publication available from http://old.ecmwf.int/publications/library/ecpublications/_pdf/era/era_report_series/RS_1_v2.pdf Dee et al., (2011), The ERA-Interim reanalysis: configuration and performance of the data assimilation system. Q.J.R. Meteorol. Soc., 137: 553–597. doi: 10.1002/qj.828
Product format	NetCDF and GRIB
Data gridding and resolution	~ 80 km spatial resolution, 6-hourly, 60 vertical levels (surface to 0.1 hPa). T255 Spectral resolution and reduced N256 Gaussian grid.
Data coverage: temporal	1979-current
Data coverage: spatial	Global
Third party redistribution.	Prohibited.
Availability of regular upgrades, update cycle	Updated in real time for the foreseeable future (2 months lag).
Alternative data sources	ERA-interim will continue to be updated for the foreseeable future to be replaced eventually by ERA5 which will then be updated, possible around 2017.
Comments	

Product name	**ESA CCI Land Cover Map**
Data description	Three satellite-derived global land cover (LC) maps representative for the 1998-2002, 2003-2007 and 2008-2012 epochs, with associated uncertainty information
Source	European Space Agency (ESA) Climate Change Initiative (CCI)
Key Websites	http://www.esa-landcover-cci.org/
Version	Version 1 (Phase 1)
References to technical specifications documents	LC CCI Algorithm Theoretical Basis Document v2, 2013 (http://www.esa-landcover-cci.org/?q=webfm_send/75) LC CCI Product User Guide v2, 2014 (http://www.esa-landcover-cci.org/?q=webfm_send/84)
Product format	NetCDF (CF-1.6)
Data gridding and resolution	Regular 0.002778 degrees lat/long (approx. 300 m spatial resolution).

Data coverage: temporal	1998-2012
Data coverage: spatial	Global.
Third party redistribution.	Not permitted (but note data set is 'free and open access')
Availability of regular upgrades, update cycle	ESA LC CCI Phase 2 currently underway which will improve upon, and temporally extend Phase 1 products. Phase 2 will be undertaken 2015-2018.
Alternative data sources	Not known / not applicable.
Comments	Land cover classification is semi-static and version 1 land cover maps can be used during the EUSTACE lifetime and for a few years beyond the end of the project.

Product name	**CryoClim Snow cover** Level 3 data products: 'daily-multi-sce-nhl' and 'daily-multi-sce-nhl'
Data description	Snow cover estimated from optical and passive microwave satellite data.
Source	CryoClim (project funded and facilitated by the Norwegian Space Centre and the European Space Agency).
Key Websites	http://www.cryoclim.net/cryoclim/index.php/CryoClim
Version	Version 1 (prototype product)
References to technical specifications documents	None available (expected at a later date)
Product format	NetCDF (CF-1.4)
Data gridding and resolution	5 km EASE grid (Equal-Area Scalable Earth)
Data coverage: temporal	25-07-1992 to 01-08-2009 (anticipated from circa 2000 required for EUSTACE))
Data coverage: spatial	Global (one file per hemisphere)
Third party redistribution.	Not permitted without special permission from the Norwegian Computing Center. Data set is 'free and open access'.
Availability of regular upgrades, update cycle	Data for 2009 – present expected by end 2015. Regular updates anticipated thereafter (likely monthly but to be confirmed). Daily updates may also be available by the end of EUSTACE.
Alternative data sources	Snow mask included in LST products.
Comments	The satellite LST products used in EUSTACE include a per-pixel snow mask. These masks will also be used in the project with the CryoClim products used as an extra independent 'check' for identifying snow-covered pixels. The CryoClim dataset includes microwave observations, which provides additional useful information, especially at night. CryoClim Snow cover data field 'sca' contents: 41: water 43: glacier (or otherwise known permanent snow cover) 100: bare ground 200: snow cover Contact Øystein Rudjord (oystein.rudjord@nr.no) for further information.

Product name	**20th Century Reanalysis**
Data description	Reanalysis
Source	The 20th Century Reanalysis (Version 2) Dataset was produced by the National Oceanic and Atmospheric Administration (NOAA) and University of Colorado's Cooperative Institute for Research in Environmental Sciences (CIRES), members of the international Twentieth Century Reanalysis (20CR) project. The data were produced through international cooperation under the auspices of the international Atmospheric Circulation Reconstructions over the Earth (ACRE) initiative, and working groups of the Global Climate Observing System (GCOS) and the World Climate Research Program (WCRP).
Key Websites	http://www.esrl.noaa.gov/psd/data/20thC_Rean/
Version	Version 2
References to technical specifications documents	http://www.esrl.noaa.gov/psd/data/20thC_Rean/
Product format	Grib1
Data gridding and resolution	Analyses every 6 hours on a 2 degree grid were produced to give the most likely state of the atmosphere based on a 56 ensemble member runs. Means, spreads and all ensemble members for each time step are available in the dataset archived at the BADC.
Data coverage: temporal	1871-2009
Data coverage: spatial	Global
Third party redistribution.	No, but data are freely available to all registered CEDA users.
Availability of regular upgrades, update cycle	20th Century reanalysis will only be used for historical part of EUSTACE so updates are not needed
Alternative data sources	n/a
Comments	Other comments.

2.2 FIDUCEO Project

Below is a summary of the FIDUCEO a preliminary acquisition list which may be available to BACI - permission for sharing will need to sought on a case by case basis. Note that AVHRR data are already held on CEMS as part of the ESA CCI SST project.

Product name	ESA SST CCI Analysis Long-term product
Data description	Interpolated (gap-filled) daily sea surface temperature
Source	European Space Agency Climate Change Initiative Sea Surface Temperature (SST CCI)
Key Websites	http://dx.doi.org/10.5285/878bef44-d32a-40cd-a02d-49b6286f0ea4 http://cci.esa.int http://badc.nerc.ac.uk/browse/neodc/esacci_sst
Version	v1.0
References to technical specifications documents	Merchant, C. J., Embury, O., Roberts-Jones, J., Fiedler, E., Bulgin, C. E., Corlett, G. K., Good, S., McLaren, A., Rayner, N., Morak-Bozzo, S. and Donlon, C. (2014), Sea surface temperature datasets for climate applications from Phase 1 of the European Space Agency Climate Change Initiative (SST CCI). Geoscience Data Journal. doi: 10.1002/gdj3.20 http://www.esa-sst-cci.org/sites/default/files/Documents/public/SST_CCI-PUG-UKMO-001_Issue-3-signed-accepted.pdf
Product format	NetCDF
Data gridding and resolution	0.05° x 0.05° equal-angle latitude-longitude gird
Data coverage: temporal	1991 to 2010
Data coverage: spatial	Global
Third party redistribution.	Access to ESA CCI SST data are available under a Creative Commons Licence by attribution, which means users may: **Share** — copy and redistribute the material in any medium or format: **Adapt** — remix, transform, and build upon the material; for any purpose, even commercially. This is conditional on appropriate attribution and providing a link to the license.
Availability of regular upgrades, update cycle	Next update in 2017
Alternative data sources	HadISST
Comments	The analysis takes as input satellite data only, from AVHRRs and ATSRs, processed by SST CCI techniques.

Product name	HIRS data
Data description	Complete set of HIRS data (1981–2015, 15 satellites).
Source	Copy obtained from University of Hamburg by Gerrit Holl (UoR) of the FIDUCEO project. This data is a copy of the NOAA archive
Key Websites	http://www.class.ncdc.noaa.gov/data_available/tovs_atovs/index.htm
Version	Needs verification

References to technical specifications documents	**HIRS Comprehensive Information** Additional information on the HIRS sensor can be found in the NOAA KLM User's Guide at: http://www.ncdc.noaa.gov/oa/pod-guide/ncdc/docs/klm/html/c3/sec3-2.htm Details of the HIRS data sets can be found in the NOAA KLM User's Guide at: http://www.ncdc.noaa.gov/oa/pod-guide/ncdc/docs/klm/html/c8/sec831-5.htm If you need information on the HIRS/2 Instrument, go to HIRS/2.
Product format	Needs verification
Data gridding and resolution	
Data coverage: temporal	1991 to 2010
Data coverage: spatial	Global
Third party redistribution.	
Availability of regular upgrades, update cycle	N/A
Alternative data sources	NOAA archive
Comments	

2.3 JASMIN: data requested for hosting on CEMS by JASMIN users

Below are possible candidates for bringing onto JASMIN/CEMS driven by requests from users; input from the BACI project will influence the priority order.

4	MERIS	Full resolution UK product
5	MERIS	Full resolution (other - TBD)
6	AATSR	LST (Leicester product)
11	MODIS	LST (Leicester product)
13	Seviri	Temperature and Radiative products, L1b, L3
14	Seviri	APOLLO CPP
15	Seviri	EUMETSAT CLS (cloud products)
16	Seviri	MSG-CPP
17	Seviri	CM-SAF CPP
18	SCIAMACHY	L1B (version?)
19	MISR	Aerosol products: Lvl2 MIL2ASAE,

20	MISR	Aerosol products: Lvl 3 MIL3MAEN
21	METOP	NRT
31	Landmap	All products as licensing allows

2.4 Data on main CEDA archive

The main data archive on CEDA is accessible here: http://catalogue.ceda.ac.uk/uuid/d40e4067ae0121b31bb1ba57e04707de

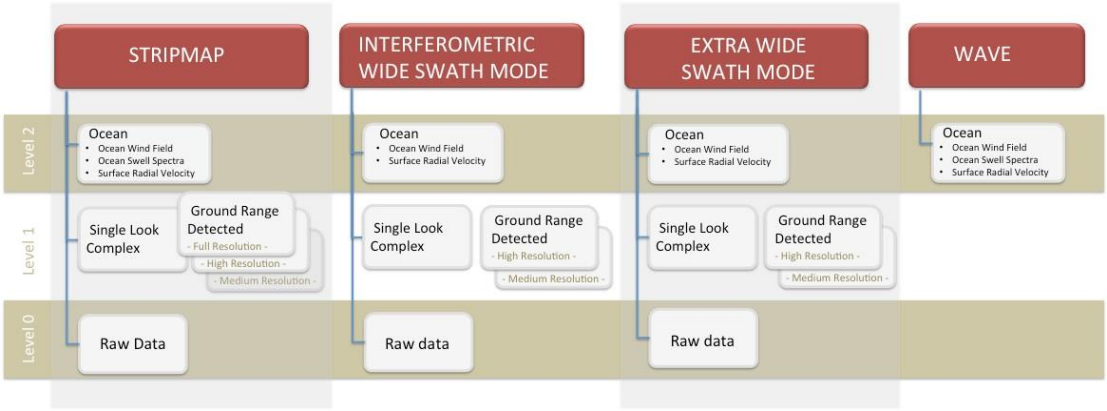
2.4.1 Sentinel data

Currently:

- S1A EW GRD M products (medium resolution Ground Range Detected (GRD) products for Extra Wide Swath operating mode)
- S1A IW GRD H products (high resolution interforometric wide (IW) swath mode GRD products)
- S1A IW SLC products (IW Single Look Complex) data – see http://browse.ceda.ac.uk/browse/neodc/sentinel1a/data

As of mid-2015 it is likely that S1A IW GRD M, S1A EW GRD H (& SLC) products will be held but this requires ESA to put them on the hub to enable them to be picked up; likewise for the StripMap mode data (bands 1 to 6).

A summary of what ESA will be making available https://sentinel.esa.int/documents/247904/1824983/Sentinel-1-core-fig-1.jpg



The current JASMIN plan is to prioritise in response to community need. So for specific BACI requirements the JASMIN team will attempt to prioritise these data collections and holdings.

Note that on CEDA/CEMS it is possible to read the subset of Sentinel data directly from the CEDA archive, process it and then write to the BACI group workspace i.e. there is no need to transfer the full data set to the BACI GWS

2.4.2 EUFAR: European Facility for Arirborne Research

In addition to the ARSF data, CEDA also archives data from the broader EUFAR program: http://www.eufar.net/

A useful way to check of some of the flight coverage matches BACI key areas of investigation is to use the flight finder tool: http://flight-finder.ceda.ac.uk/

The EUFAR instrumentation list can also be found here: http://www.eufar.net/experiment/instrument/general_inst.htm

2.5 ESA CCI Products

As part of the ESA CCI open data portal project CEDA/CEMS will be getting (late 2015) sub-sets of products from all the ESA CCI teams. Probably the most relevant ECV projects to BACI are:

Fire: Phase 1 Burned Area products (from https://geogra.uah.es/esa/)
Soil Moisture: A copy of their latest v2.1 data
Land Cover: The 3 global landcover maps (see http://maps.elie.ucl.ac.be/CCI/viewer/download.php)

We will also get additional products as they become available but not everything will end up within CEDA, the ESA portal. The final CCI products have not been completely defined yet, so it is not possible to provide a comprehensive list at the moment. The CCI website provides information on current status of ESA CCIs: http://cci.esa.int/.

2.6 Data available to (and potentially via) EU QA4ECV, additional to that held on CEDA/CEMS

These data are available to the EU QA4ECV project, via various partners and collaborations. BACI partner J.-P. Muller (UCL MSSL) leads the land component of QA4ECV and has indicated that where desired, BACI may be granted access to some of these datasets, on a case by case basis.

Data set name	Version	Description	Ref/DOI	Geographical coverage	Period	Person responsible	Institution	Data storage location	Data set size	Remark
OMI level 1B	NASA Collection 003	OML1BUG OML1BUZ OML1BVG OML1BVZ	URL	Global	20041001-20150531	Quintus Kleipool (kleipool@knmi.nl)	KNMI/NASA	KNMI mass storage system, BIRA-IASB, NASA disc	20 Tb	Hdf4
GOME2a level 1B	EUMETSAT/R/5_12 EUMETSAT/N/5_12 EUMETSAT/N/6_12	Reprocessed NRT		Global	20070101-20120124 20120125-20140617 20140617-20141231		EUMETSAT	BIRA-IASB	26 Tb 17 Tb	binary
GOME2b level 1B	EUMETSAT/N/5_12 EUMETSAT/N/6_12	NRT		Global	20121210-20140617 20140617-20150220		EUMETSAT	BIRA-IASB	12 Tb	binary
SCIAMACHY level 1	ESA/Y/8_01	reprocessed level1		Global	20020802-20120408		ESA	BIRA-IASB	17 Tb	Calibration step needed
GOME level 1	DLR/OFL	Reprocessed level 1		Global until 20030622 Europe from 20030716	19950628-20110703		ESA	BIRA-IASB	278 Gb 74 Gb	binary
OMI HCHO SCD	V14	TEMIS product	(4)	Global	20041001-20141231	I. De Smedt (isabelle.desmedt@aeronomi	BIRA-IASB	BIRA-IASB (17)	2.5 Tb	Hdf5

						e.be)				
GOME2a HCHO SCD	V14	TEMIS product	(4) (3)	Global	20070101-20131231	I. De Smedt (isabelle.desmedt@aeronomie.be)	BIRA-IASB	BIRA-IASB (17)	140 Gb	HDF5
GOME2b HCHO SCD	V14	TEMIS product	(4) (3)	Global	20130101-20141231	I. De Smedt (isabelle.desmedt@aeronomie.be)	BIRA-IASB	BIRA-IASB (17)	40 Gb	HDF5
SCIAMACHY HCHO SCD	V12	TEMIS product	(3) (2)	Global	20030101-20120331	I. De Smedt (isabelle.desmedt@aeronomie.be)	BIRA-IASB	BIRA-IASB (17)	100 Gb	ASC
GOME HCHO SCD	V12	TEMIS product	(3) (2)	Global	19970101-20030620	I. De Smedt (isabelle.desmedt@aeronomie.be)	BIRA-IASB	BIRA-IASB (17)	9 Gb	ASC
OMI NO2 SCD	V1.1.1	OMNO2A	(16)	Global	20041001-now	J.P. Veefkind (veefkind@knmi.nl)	KNMI / NASA	KNMI / NASA (18)	2.5 TB	HDF5
OMI NO2 SCD	V1.2.3	OMNO2A	http://disc.sci.gsfc.nasa.gov/Aura/data-holdings/OMI/omno2_v003.shtml	Global	20041001-now	J.P. Veefkind (veefkind@knmi.nl)	KNMI / NASA	KNMI / NASA (19)	2.5 TB	HDF5
GOME2a NO2 SCD	V2.3	TEMIS product TM4NO2A	(1), (20)	Global	20070101-now	I. De Smedt (isabelle.desmedt@aeronomie.be)	BIRA-IASB	BIRA-IASB (18)	70 Gb	ASC
GOME2b NO2 SCD	V2.3	TEMIS product TM4NO2A	(1), (20)	Global	20130101-now	I. De Smedt (isabelle.desmedt@aeronomie.be)	BIRA-IASB	BIRA-IASB (18)	25 Gb	ASC
SCIAMACHY NO2 SCD	V2.3	TEMIS product TM4NO2A	(1), (20)	Global	20020802-20120430	I. De Smedt (isabelle.desmedt@aeronomie.be)	BIRA-IASB	BIRA-IASB (18)	55 Gb	ASC
GOME NO2 SCD	V2.3	TEMIS product TM4NO2A	(1), (20)	Global	19960401-20030621	I. De Smedt (isabelle.desmedt@aeronomie.be)	BIRA-IASB	BIRA-IASB (18)	4 Gb	ASC

IASI FORLI-CO	v20100815	Ascii files CO total columns as well as corresponding averaging kernels	(9) (8) (7)	Global	Oct. 2007 to present	Maya George maya.george @latmos.ipsl.fr	ULB-LATMOS	French Ether database (15)	~250 MB/day	Level 2
MOPITT	v5T	HDF files CO total columns, profiles and averaging kernels	(5) (6)	Global	March 2000 to present	Merritt Deeter mnd@ucar.edu	NCAR	Public archive	~250 MB/day	Level 2
HRI Level 1.5 Image Data - MFG - 0 degree	N/A	(10)	N/A	West Bound Long: -81.0 East Bound Long: 81.0 North Bound Lat: 81.0 South Bound Lat: -81.0 SSP: 0 degree	16/08/1981 - 19/07/2006	EUMETSAT (ops@eumetsat.int)	EUMETSAT	EUMETSAT Data Centre	~19 Tb	Single File size: 38 Mb Format: RECT2LP
HRI Level 1.5 Image Data - MFG - Indian Ocean	N/A	(11)	N/A	West Bound Long: -24.0 East Bound Long: 138.0 North Bound Lat: 81.0 South Bound Lat: -81.0 SSP: 63E or 57E degree	01/07/1998 – ongoing	EUMETSAT (ops@eumetsat.int)	EUMETSAT	EUMETSAT Data Centre	~13 Tb	Single File size: 38 Mb Format: RECT2LP
HRI Level 1.5 Image Data - MFG - ADC	N/A	(12)	N/A	West Bound Long: -131.0 East Bound Long: 31 North Bound Lat: 81.0 South Bound Lat: -81.0 SSP: 50W degree	01/08/1991 - 27/01/1993	EUMETSAT (ops@eumetsat.int)	EUMETSAT	EUMETSAT Data Centre	~775 Gb	Single File size: 38 Mb Format: RECT2LP
HRI Level 1.5 Image Data - MFG - XADC	N/A	(13)	N/A	West Bound Long: -140.0 East Bound Long: -10.0 North Bound Lat: 65.0 South Bound Lat: -65.0 SSP: 75W degree	01/08/1993 - 31/05/1995	EUMETSAT (ops@eumetsat.int)	EUMETSAT	EUMETSAT Data Centre	~1.3 Tb	Single File size: 38 Mb Format: RECT2LP
High Rate SEVIRI Level 1.5 Image	N/A	(14)	N/A	West Bound Long: -79.0	19/01/2004 -ongoing	EUMETSAT (ops@eumets	EUMETSAT	EUMETSAT Data	~85 Tb	Single File size:

Data - MSG - 0 degree				East Bound Long: 79.0 North Bound Lat: 81.0 South Bound Lat: 81.0 SSP: 0 degree		at.int)		Centre		259 Mb Format:Native
DIMITRI	V2.0	The Database for Imaging Multi-spectral Instruments and Tools for Radiometric Intercomparison (DIMITRI) contains L1 from AATSR, MERIS, AQUA-MODIS, PARASOL and VEGETATION-2	DIMITRI	Libya-4	2000 - 2010	Marc Bouvet	ESA	Rayference	4Mb	ASCII format
MISR TOA BRF	12	MISR TOA BRF L1 data acquired over Libya-4		Libya-4	2000 - 2010		NASA	Rayference	1Mb	ASCII format
GOME-2 TOA BRF	1	GOME-2 TOA BRF L1 data acquired over Libya-4		Libya-4	2006-2009	Rosemary Munro	Eumetsat	Rayference	3Mb	ASCII format
AVHRR18 LTDR	V 4.2	AVHRR18 LTDR TOA BRF acquired over Libya-4	URL	Libya-4	2006-2009	Eric Vermote	NASA	Rayference	1Mb	ASCII format
MSG-2 Level 1.5	N/A	SEVIRI VIS data		MSG Disk	2008	ops@eumetsat.int	EUMETSAT	Rayference	2Tb	

2.7 Data available to (and potentially via) UK NERC-funded Bioclim project

These are datasets collated by BACI partner Rezatec, who are co-located with CEMS, as part of a UK-funded 'big data' project in conjunction with various UCL departments (BACI partner Disney is involved). The project aims to provide a tool to explore critical research areas relating to biodiversity, population and climate such as: pattern and trends of biodiversity change; changes under LULUC; co-variant relationships with biodiversity and land carbon; loss of biodiversity impact on human health; MRV for carbon trading and biodiversity assessment; quantify and commodify ecosystem services. These data are currently not on CEMS, but can potentially be made available on a case-by-case basis.

Dataset type	Description	Source	Data URL	Time freq.	Years	Data type	Data Format	Data projection	Data resolution	Extent	Size (MB)
Climate, Weather											
GPCC v7	GPCC montly precipitation	http://www.esrl.noaa.gov/psd/data/gridded/data.gpcc.html	ftp://ftp.dwd.de/pub/data/gpcc/html/fulldata_v6_doi_download.html	monthly	1901-2014	raster	netcdf	?	?	Global	1500
CRUTEM4.3.0.0	land surface temperature dataset is CRUTEM.4.3.0.0.anomalies and can be downloaded in either netcdf or text format	http://www.metoffice.gov.uk/hadobs/crutem4/data/download.html		monthly	1850-2014	raster	netcdf	?		Global	20
HadCRUT4.3.0.0	Dataset combining land and ocean temperature - HadCRUT4.3.0.0.median	http://www.metoffice.gov.uk/hadobs/hadcrut4/data/current/download.html		monthly	1850-2014	raster	netcdf	?		Global	20

Human Activity											
NASA SEDAC Gridded Population of the World	Population density	http://sedac.ciesin.columbia.edu/data/set/gpw-v3-population-density	http://sedac.ciesin.columbia.edu/data/set/gpw-v3-population-density/data-download	once	1990, 1995, 2000, 2005, 2010, 2015	raster	.adf	EPSG: 4326 - WGS 84	2.5 arc - minute grid cells	Global	407
Landuse, Geography											
(PDSI)	Palmer drought severity index	http://www.ncdc.noaa.gov/temp-and-precip/drought/historical-palmers.php	http://www1.ncdc.noaa.gov/pub/data/cirs/climdiv/	monthly	1895-2014	vector	.shp	EPSG: 4269 - NAD83	State	US	268
NOAA Tree Ring Drought Dataset	Tree ring reconstructed drought data	http://www.ncdc.noaa.gov/data-access/paleoclimatology-data/datasets/tree-ring/north-american-drought-variability		yearly	0 AD - 2006	raster	netcdf			US	5
US Drought Monitor	Drought Dataset	http://droughtmonitor.unl.edu/MapsAndData/GISData.aspx	http://droughtmonitor.unl.edu/MapsAndData/GISData.aspx	weekly	2000-2015	vector	.shp	EPSG: 4326 - WGS 84	?	US	864
GAP	Land Classifciation	http://gapanalysis.usgs.gov/gaplandcover/	http://gapanalysis.usgs.gov/gaplandcover/data/download/	once	-	raster	.img	??? EPSG: 3310 - NAD83 / California Albers	30m	California	931
NASA GRACE Monthly Mass Grids - Land	Cumulative water storage changes	http://grace.jpl.nasa.gov/data/gracemonthlymassgridsland/	ftp://podaac-ftp.jpl.nasa.gov/allData/tellus/L3/land_mass/RL05/	monthly	2002-2014	raster	geotiff	EPSG: 4326 - WGS 84	1 degree (~111km)	Global	102
National Park Service unit boundaries	National Park boundaries	http://catalog.data.gov/harvest/object/de514a35-2e2e-4cc4-8265-acbc0d6a10fa/html	https://geoplatform.gov/node/243/9d9fe91e-da81-4488-bb02-8adf66b6182d	once	-	vector	.shp	EPSG: 4269 - NAD83	-	US	22

USGS Groundwater Watch	Ground water dataset	http://waterdata.usgs.gov	http://groundwaterwatch.usgs.gov/Net/OGWNetworkLTN.asp?ncd=ltn&d=1&a=2	monthly	1995-2015	vector	shp	NAD83	station	US	26
										Total:	**2218**

2.8 Microwave data products (incl. Synergy with Optical) to be held/processed on CEMS

Below are listed the microwave products that are either currently (mid-2015) uploaded onto CEMS, but also those that are being processed by BACI partner FSU, and uploaded to CEMS.

Data set name	Version	Description	Ref/DOI	Geographical coverage	Period	Person responsible	Institution	Data storage location	Data set size	Remark
Soil Moisture										
Soil Moisture	02.1	ESA CCI Soil Moisture	http://www.esa-soilmoisture-cci.org/node/index.php?q=node	Global	1979 - 2010	http://www.esa-soilmoisture-cci.org/contact%20points	ESA, TUW	CEMS	~ 60 GB	
BIOMASS										
BIOMASAR-II [22]	1	GSV	http://biomasar.org/	northern hemisphere	2009 - 2011	http://biomasar.org/index.php?id=66	GAMMA, FSU JENA	CEMS		*The BIOMASAR data products have been generated within the European Space Agency (ESA) Support to Science Element (STSE) project BIOMASAR (ESRIN contract No. 21892/08/I-EC).*
IIASA [23]	1	FAO data downscaling by RS	http://www.iiasa.ac.at/web/home/research/modelsData/GlobalForestDB.en.html	global (Forest, MG dm/ha)	2005	kinder@iiasa.ac.at	IIASA	CEMS		23
NASA [24]		Lidar (GLAS) + spatial imagery	http://carbon.jpl.nasa.gov/index.cfm	tropics (Forest, MG dm/ha)	2000	Sassan Saatchi, sassan.saatchi@jpl.nasa.gov	NASA	CEMS		

		(MODIS, SRTM, QSCAT) + Inventory plots								
WHRC		**Field + LiDAR(GLAS) + MODIS; MODIS + field measurements**	**http://www.whrc.org/mapping/nbcd/**	**tropics (Forest, MG dm/ha)**	**2003, 2010**	**glasbiomass@whrc.org**	**WHRC**	**CEMS**		**http://www.whrc.org/mapping/pantropical/carbon_dataset.html**
JOANNEUM RESEARCH [25]		**MODIS + forest inventory**	**http://biomass.geo-wiki.org/login.php?menu=description**	**Europe (growing stock m³/ha)**	**2000**	**GEO-WIKI**	**JOANNEUM RESEARCH**	**CEMS**		**http://www.sciencedirect.com/science/article/pii/S0378112709007403**
Snow Cover										
Snow Cover		**GlobSnow v2.0**	**http://www.globsnow.info/**	**Global**	**Since 1978**	**Dr. Kari Luojus,+358 40 505 8417**	**ESA, FMI**			
Above Ground Biomass Carbon (ABC) and Vegetation Optical Depth (VOD)										
Global Above Ground Biomass Carbon (ABC)	1.0	ABC from AVHRR	URL	Global at 0.25 deg	1993-2012	Liu and Van Dijk (see URL)	UCL Geog	CEMS	32MB	0.25 deg
Global Vegetation Optical Depth (VOD)	1.0	VOD from AVHRR	URL	Global at 0.25 deg	1993-2012	Liu and Van Dijk (see URL)	UCL Geog	CEMS	32MB	0.25 deg

References

(1) Boersma, K.F., H.J. Eskes and E.J. Brinksma, Error Analysis for Tropospheric NO2 Retrieval from Space, J. Geophys. Res. 109 D04311, doi:10.1029/2003JD003962, 2004.

(2) De Smedt, I., Müller, J.-F., Stavrakou, T., van der A, R., Eskes, H. and Van Roozendael, M.: Twelve years of global observations of formaldehyde in the troposphere using GOME and SCIAMACHY sensors, Atmos. Chem. Phys., 8(16), 4947-4963, 2008.

(3) De Smedt, I., Van Roozendael, M., Stavrakou, T., Müller, J.-F., Lerot, C., Theys, N., Valks, P., Hao, N., and van der A, R.: Improved retrieval of global tropospheric formaldehyde columns from GOME-2/MetOp-A addressing noise reduction and instrumental degradation issues, Atmos. Meas. Tech. Discuss., 5, 5571-5616, doi:10.5194/amtd-5-5571-2012, Special Issue: GOME-2: calibration, algorithms, data products and validation, 2012.

(4) De Smedt, I., Stavrakou, T., Hendrick, F., Danckaert, T., Vlemmix, T., Pinardi, G., Theys, N., Lerot, C., Gielen, C., Vigouroux, C., Hermans, C., et al.: Diurnal, seasonal and long-term variations of global formaldehyde columns inferred from combined OMI and GOME-2 observations, Atmos. Chem. Phys. Discuss., 15(8), 12241–12300, doi:10.5194/acpd-15-12241-2015, Special Issue: Ten years of Ozone Monitoring Instrument (OMI) observations, 2015.

(5) Deeter, M. N., Emmons, L. K., Francis, G. L., Edwards, D. P., Gille, J. C., Warner, J. X., Khattatov, B., Ziskin, D., Lamarque, J. F., Ho, S. P., Yudin, V., Attié, J. L., Packman, D., Chen, J., Mao, D., and Drummond, J. R.: Operational carbon monoxide retrieval algorithm and selected results for the MOPITT instrument, J. Geophys. Res., 108, 4399, doi:10.1029/2002JD003186, 2003.

(6) Deeter, M. N., Martínez-Alonso, S., Edwards, D. P., Emmons, L. K., Gille, J. C., Worden, H. M., Pittman, J. V., Daube, B. C., and Wofsy, S. C.: Validation of MOPITT Version 5 thermal-infrared, near-infrared, and multispectral carbon monoxide profile retrievals for 2000–2011, J. Geophys. Res. Atmos., 118, 6710–6725, doi:10.1002/jgrd.50272, 2013.

(7) George, M., Clerbaux, C., Bouarar, I., Coheur, P.-F., Deeter, M. N., Edwards, D. P., Francis, G., Gille, J. C., Hadji-Lazaro, J., Hurtmans, D., Inness, A., Mao, D., and Worden, H. M.: An examination of the long-term CO records from MOPITT and IASI: comparison of retrieval methodology, Atmos. Meas. Tech. Discuss., 8, 4095-4135, doi:10.5194/amtd-8-4095-2015, 2015.

(8) George, M., Clerbaux, C., Hurtmans, D., Turquety, S., Coheur, P.-F., Pommier, M., Hadji-Lazaro, J., Edwards, D. P., Worden, H., Luo, M., Rinsland, C., and McMillan, W.: Carbon monoxide distributions from the IASI/METOP mission: evaluation with other space-borne remote sensors, Atmos. Chem. Phys., 9, 8317-8330, doi:10.5194/acp-9-8317-2009, 2009.

(9) Hurtmans, D., Coheur, P.-F., Wespes, C., Clarisse, L., Scharf, O., Clerbaux, C., Hadji-Lazaro, J., George, M., and Turquety, S.: FORLI radiative transfer and retrieval code for IASI, J. Quant. Spectrosc. Radiat. Transfer, 113, 1391–1408, doi:10.1016/j.jqsrt.2012.02.036, 2012.

(10) Image data in the form of high rate transmissions in 3 spectral channels available at 30-minute intervals with coverage over Europe, Africa, North Atlantic and parts of South America. Level 1.5 images are pre-processed in such a way that all image pixels are remapped on to a reference image corresponding to an image taken by the MTP satellite located at its nominal position over the equator and with a nominal attitude, i.e. with the satellite spin axis parallel to the spin axis of the earth. In addition, all image lines are aligned and the coordinates of image pixels of the different radiometer channels are adjusted so that they correspond to information from the same point on the earth's surface.

(11) Image data in the form of high rate transmissions in 3 spectral channels available at 30-minute intervals with coverage over the Indian Ocean. Level 1.5 images are pre-processed in such a way that all image pixels are remapped on to a reference image corresponding to an image taken by the MTP satellite located at its nominal position over the equator and with a nominal attitude, i.e. with the satellite spin axis parallel to the spin axis of the earth. In addition, all image lines are aligned and the coordinates of image pixels of the different radiometer channels are adjusted so that they correspond to information from the same point on the earth's surface.

(12) Atlantic Data Coverage (ADC) image data in the form of high-rate transmissions in 3 spectral channels available at 30-minute intervals. Level 1.5 images are pre-processed in such a way that all image pixels are remapped on to a reference image corresponding to an image taken by the satellite located at its nominal position over the equator and with a nominal attitude, i.e. with the satellite spin axis parallel to the spin axis of the earth. In addition, all image lines are aligned and the coordinates of image pixels of the different radiometer channels are adjusted so that they correspond to information from the same point on the earth's surface.

(13) Extended Atlantic Data Coverage (XADC) image data in the form of high-rate transmissions in 3 spectral channels available at 30-minute intervals. Level 1.5 images are pre-processed in such a way that all image pixels are remapped on to a reference image corresponding to an image taken by the satellite located at its nominal position over the equator and with a nominal attitude, i.e. with the satellite spin axis parallel to the spin axis of the earth. In addition, all image lines are aligned and the coordinates of image pixels of the different radiometer channels are adjusted so that they correspond to information from the same point on the earth's surface.

(14) Rectified (level 1.5) Meteosat SEVIRI image data. The data is transmitted as High Rate transmissions in 12 spectral channels. Level 1.5 image data corresponds to the geolocated and radiometrically pre-processed image data, ready for further processing, e.g. the extraction of meteorological products. Any spacecraft specific effects have been removed, and in particular, linearisation and equalisation of the image radiometry has been performed for all SEVIRI channels. The on-board blackbody data has been processed. Both radiometric and geometric quality control information is included.

(15) Password can be obtained on request to pfcoheur@ulb.ac.be or cathy.clerbaux@latmos.ipsl.fr

(16) van Geffen, J. H. G. M., Boersma, K. F., Van Roozendael, M., Hendrick, F., Mahieu, E., De Smedt, I., Sneep, M., and Veefkind, J. P.: Improved spectral fitting of nitrogen dioxide from OMI in the 405–465 nm window, Atmos. Meas. Tech., 8, 1685-1699, doi:10.5194/amt-8-1685-2015, 2015.

(17) HCHO slant column data is part (intermediate product) of the BIRA HCHO data products publicly available via www.temis.nl.

(18) NO2 slant column data is part (intermediate product) of the KNMI/BIRA NO2 data products publicly available via www.temis.nl.

(19) OMNO2A v1.2.3 slant columns are used as input for the NASA Standard Product for NO2.

(20) Boersma, K. F., Eskes, H. J., Dirksen, R. J., van der A, R. J., Veefkind, J. P., Stammes, P., Huijnen, V., Kleipool, Q. L., Sneep, M., Claas, J., Leitão, J., Richter, A., Zhou, Y., and Brunner, D.: An improved tropospheric NO2 column retrieval algorithm for the Ozone Monitoring Instrument, Atmos. Meas. Tech., 4, 1905-1928, doi:10.5194/amt-4-1905-2011, 2011.