EUMETSAT's Drought & Vegetation Data Cube

A prototype

Information Day: 11 May 2021

Christine Träger-Chatterjee

Draft Agenda D&V Cube Info Day

09:30 – 09:45: Welcome & Introduction

- Background – why a cube?
- What is in the cube?
- Where to find information about the cube?

09:45 – 10:30: The Drought & Vegetation Data Cube: Introduction to the variables

11:00 – 11:15: COFFEE BREAK

11:15 – 11:30: Access to the Data Cube and CM SAF R Toolbox demonstration

11:45 – 12:15: Climatological drought monitoring in Switzerland using SAF satellite products

12:15 – 12:45: What now? – The Exploration Phase!

12:45 – 13:00: Q & A and Feedback

- Questions on today's presentations:
  slido.com, code: *dvcube*

- D&V Cube Page (moodle course):
  https://training.eumetsat.int/course/view.php?id=399#section-2

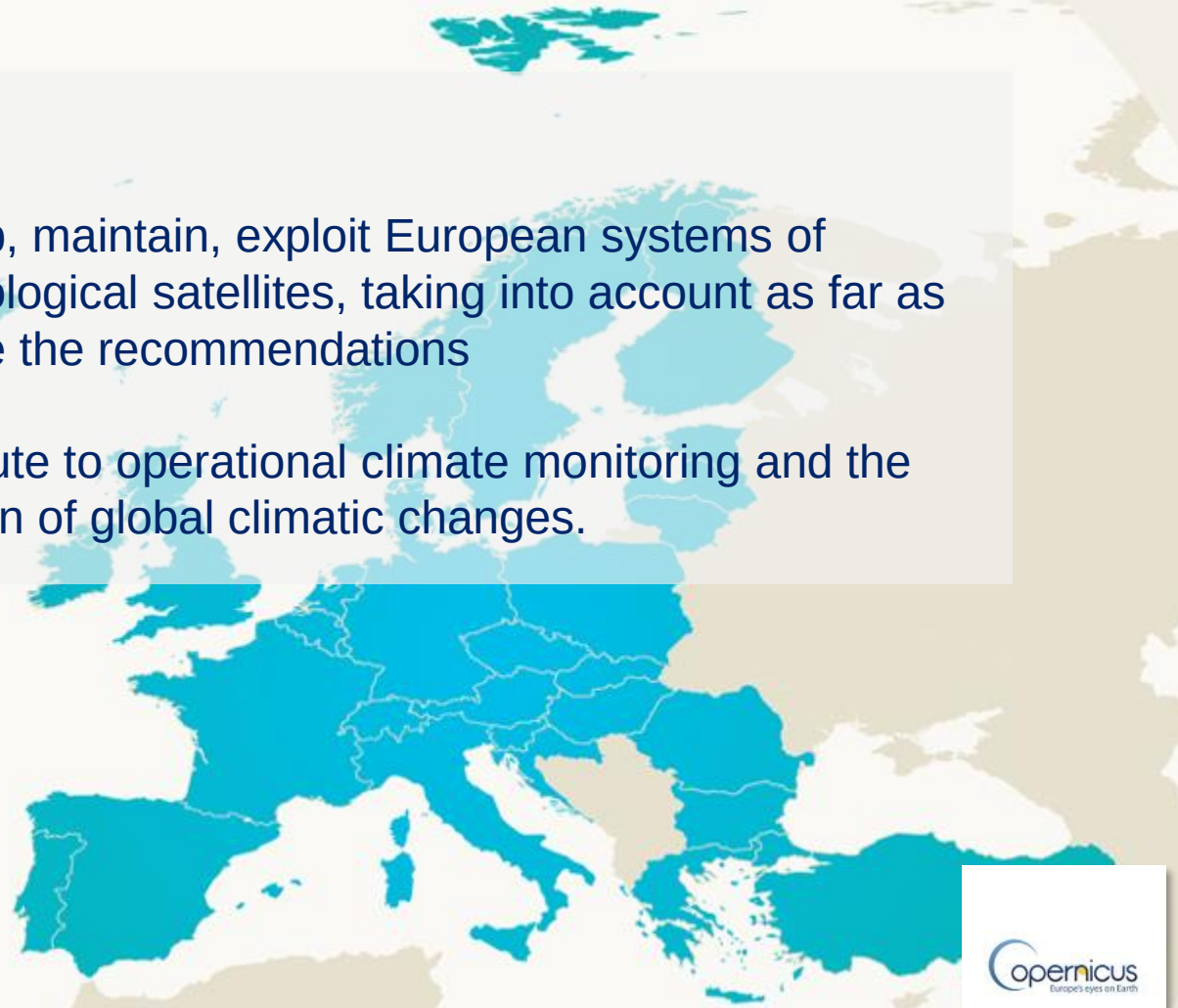
- Have you worked with satellite data before?

EUMETSAT is an intergovernmental Organization

AUSTRIA
BELGIUM
BULGARIA
CROATIA
CZECH REPUBLIC
DENMARK
ESTONIA
FINLAND
FRANCE
GERMANY
GREECE
HUNGARY
ICELAND
IRELAND
ITALY
LATVIA
LITHUANIA
LUXEMBOURG
THE NETHERLANDS
NORWAY
POLAND
PORTUGAL
ROMANIA
SLOVAK REPUBLIC
SLOVENIA
SPAIN
SWEDEN
SWITZERLAND
TURKEY
UNITED KINGDOM

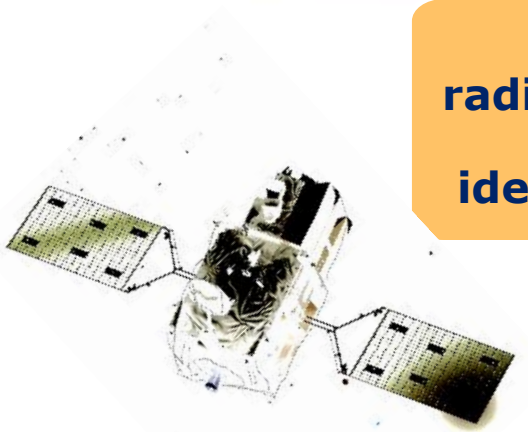
Tasks

- Develop, maintain, exploit European systems of meteorological satellites, taking into account as far as possible the recommendations
- Contribute to operational climate monitoring and the detection of global climatic changes.

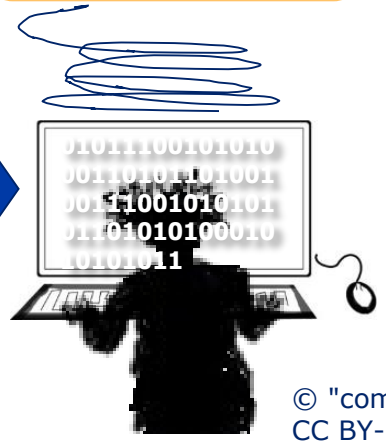


Climate Data Satellite Retrieval System

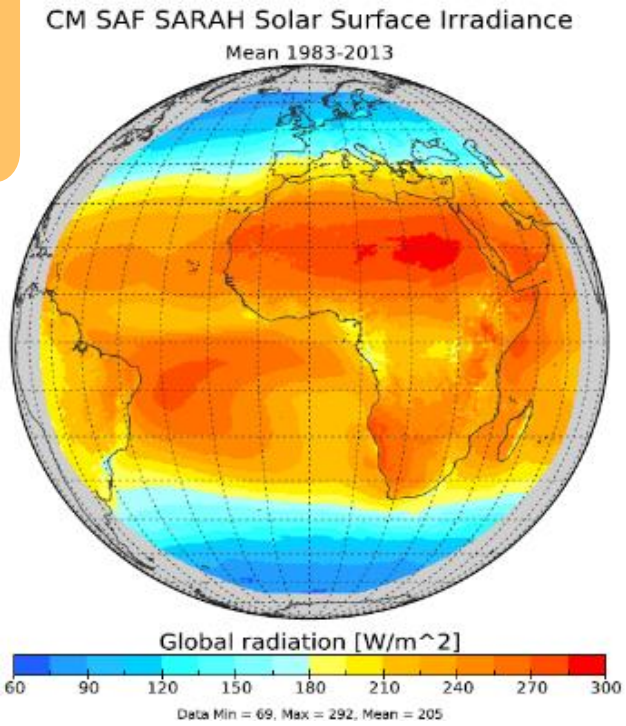
Big Data I:
radiances measured by satellites,
ideally 30 yrs or more



Smart people / algorithms + computing power



Big Data II:
ready-to-use data record, geophysical parameter



Courtesy: Jörg Trentmann (CMSAF, DWD), adjusted

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Satellite Application Facilities

Satellite Application Facilities

- EUMETSAT has a network of different Satellite Application Facilities (SAFs)
- SAFs are dedicated centers of excellence for processing satellite data
  - research, development and operational activities
  - each SAF focusses on specific user communities or application areas
- Each SAF is a consortium of entities from EUMETSAT member states

D&V Cube Data Providers

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Global Precipitation Climatology Centre

European Centre for Medium Ranger Weather Forecasting

ECMWF

The Drought & Vegetation Cube

The issue

- Many great EO data records exist
- Many providers
- Many ways of accessing data
- Many data formats

➔ Barriers of access / usage

The idea

- Bringing data closer to the user
- Analysis ready data
- Data Cubes

The prototype D&V Cube

- A data cube containing variables for drought and vegetation monitoring
- All files in netCDF4, cf-compliant
- Using a common data model
  - regular lat – lon grid
  - common metadata definitions
- This is a prototype – learn about user needs!!

Your feedback!!

- Are cubes useful for you?
- Is cf-compliant netCDF and appropriate format?
- Is the common data model appropriate?
- Is the provision appropriate?
- What would be best for your work?
- How can we serve you better?
- ….

The Drought & Vegetation Cube

Variable	Datasource	Temporal Coverage	Spatial Resolution	Temporal Resolution
Global Radiation	Satellite	Jan 1983 – Dec 2020	0.05°	Daily & monthly
Direct normal Solar Radiation	Satellite	Jan 1983 – Dec 2020	0.05°	Daily & monthly
Sunshine Duration	Satellite	Jan 1983 – Dec 2020	0.05°	Daily & monthly
Land Surface Temperature	Satellite	Jan 2004 – Dec 2020	0.05°	Hourly
Reference Evapotranspiration	Satellite	Jan 2004 – Dec 2020	0.05°	Daily
NDVI	Satellite	Mar 2007 – Dec 2020	0.01°	10-daily
Fractional Vegetation Cover	Satellite	Jan 2004 – Dec 2020	0.05°	Daily
Leaf Area Index	Satellite	Jan 2004 – Dec 2020	0.05°	Daily
Fraction of absorbed photosynthetically active radiation	Satellite	Jan 2004 – Dec 2020	0.05°	Daily
Soil Wetness Index (root zone)	Satellite	Jan 1992 – Dec 2020	0.1°	Daily
Precipitation	In situ	Jan 1982 – Dec 2020	1°	Monthly
T2m	Re-analysis	Jan 1979 – Oct 2020	0.1°	Monthly

Spatial Coverage:	**Europe**
Grid:	**Regular Lat / Lon**
Data Format:	**CF compliant netCDF4**

Access to the data cube:

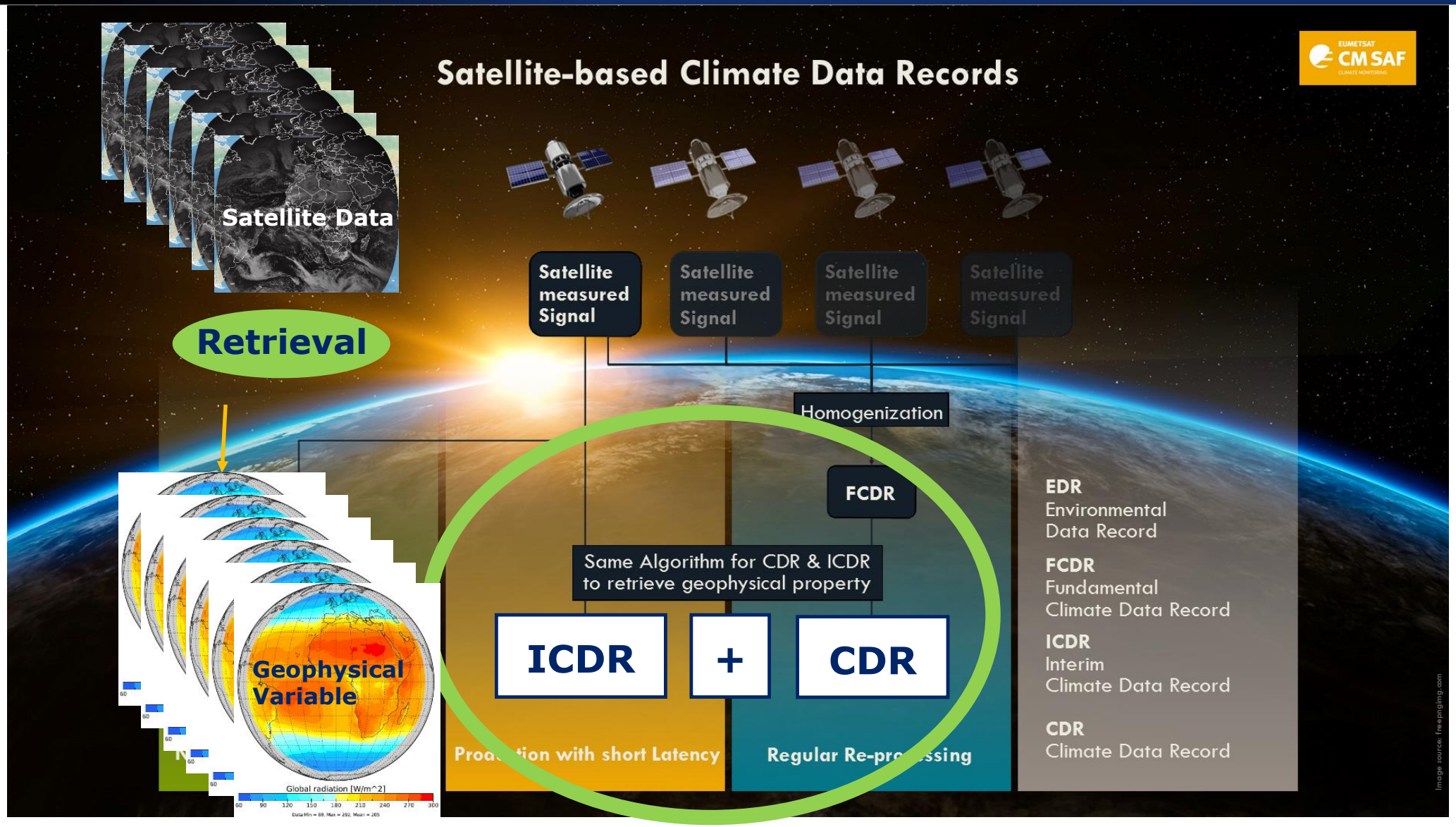
➔ Enrol to the D&V Cube Exploration Phase: https://training.eumetsat.int/course/view.php?id=399

➔ Follow the link under: "*Access to the Data Cube*"

The Drought & Vegetation Cube

Variable	Datasource	Temporal Coverage	Spatial Resolution	Temporal Resolution	Provider	CDR	ICDR
Global Radiation	Satellite	Jan 1983 – Dec 2020	0.05°	Daily & monthly	CM SAF	01 Jan 1983 – 31 Dec 2017	01 Jan 2018 – 31 Dec 2020
Direct normal Solar Radiation	Satellite	Jan 1983 – Dec 2020	0.05°	Daily & monthly	CM SAF	01 Jan 1983 – 31 Dec 2017	01 Jan 2018 – 31 Dec 2020
Sunshine Duration	Satellite	Jan 1983 – Dec 2020	0.05°	Daily & monthly	CM SAF	01 Jan 1983 – 31 Dec 2017	01 Jan 2018 – 31 Dec 2020
Land Surface Temperature	Satellite	Jan 2004 – Dec 2020	0.05°	Hourly	LSA SAF	21 Jan 2004 – 31 Dec 2015	01 Jan 2016 – 31 Dec 2020
Reference Evapotranspiration	Satellite	Jan 2004 – Dec 2020	0.05°	Daily	LSA SAF	20 Jan 2004 – 31 Dec 2015	01 Jan 2016 – 31 Dec 2020
NDVI	Satellite	Mar 2007 – Dec 2020	0.01°	10-daily	LSA SAF	11 Mar 2007 – 30 Apr 2013	01 May 2013 – 31 Dec 2020
Fractional Vegetation Cover	Satellite	Jan 2004 – Dec 2020	0.05°	Daily	LSA SAF	19 Jan 2004 - 31 Dec 2015	01 Jan 2016 – 31 Dec 2020
Leaf Area Index	Satellite	Jan 2004 – Dec 2020	0.05°	Daily	LSA SAF	19 Jan 2004 – 31 Dec 2015	01 Jan2016 – 31 Dec 2020
Fraction of absorbed photosynthetically active radiation	Satellite	Jan 2004 – Dec 2020	0.05°	Daily	LSA SAF	19 Jan 2004 – 31 Dec 2015	01 Jan2016 – 31 Dec 2020
Soil Wetness Index (root zone)	Satellite	Jan 1992 – Dec 2020	0.1°	Daily	H SAF	01 Jan 1992 – 31 Dec 2018	01 Jan 2019 – 31 Dec 2020
Precipitation	In situ	Jan 1982 – Dec 2020	1°	Monthly	GPCC	01 Jan 1982 – 31 Dec 2020	
T2m	Re-analysis	Jan 1979 – Oct 2020	0.1°	Monthly	ECMWF	01 Jan 1979 – 31 Oct 2020	

Records of Geophysical Variables from Space



[See also short video in the "D&V Cube Full Guide" on the D&V Cube Page]

Courtesy: Steffen Kothe, CM SAF /DWD (adjusted)

EUMETSAT

The Drought & Vegetation Cube

Data Provider_TypeOfRecord_**Variable**_**TemporalResolution**

CMSAF_ClimateDataRecord_**DirectNormalIrradiance**_**MonthlyMean**

CMSAF_ClimateDataRecord_**DirectNormalIrradiance**_**DailyMean**

CMSAF_ClimateDataRecord_**SunshineDuration**_**MonthlySum**

CMSAF_ClimateDataRecord_**SunshineDuration**_**DailySum**

CMSAF_ClimateDataRecord_**SolarIncomingSurface**_**MonthlyMean** **(Global Radiation)**

CMSAF_ClimateDataRecord_**SolarIncomingSurface**_**DailyMean** **(Global Radiation)**

CMSAF_InterimClimateDataRecord_**DirectNormalIrradiance**_**MonthlyMean**

CMSAF_InterimClimateDataRecord_**DirectNormalIrradiance**_**DailyMean**

CMSAF_InterimClimateDataRecord_**SunshineDuration**_**MonthlySum**

CMSAF_InterimClimateDataRecord_**SunshineDuration**_**DailySum**

CMSAF_InterimClimateDataRecord_**SolarIncomingSurface**_**MonthlyMean** **(Global Radiation)**

CMSAF_InterimClimateDataRecord_**SolarIncomingSurface**_**DailyMean** **(Global Radiation)**

EuropeanCentreForMediumRangeWeatherForecasting_**AirTemperatureIn2mAboveGround**

GlobalPrecipitationClimatologyCentre_**Precipitation**_**MonthlySum**

HSAF_ClimateDataRecord_**SoilWetnessIndex**

HSAF_InterimClimateDataRecord_**SoilWetnessIndex**

LSASAF_ClimateDataRecord_**fraction of absorbed photosynthetically active radiation**

LSASAF_ClimateDataRecord_**Fractional Vegetation Cover**

LSASAF_ClimateDataRecord_**Leaf Area Index**

LSASAF_ClimateDataRecord_**Land Surface Temperature**

LSASAF_ClimateDataRecord_**Reference Evapotranspiration**

LSASAF_ClimateDataRecord_**Normalized Difference Vegetation Index**

LSASAF_InterimClimateDataRecord_**Fraction of Absorbed Photosynthetically Active Radiation**

LSASAF_InterimClimateDataRecord_**Fractional Vegetation Cover**

LSASAF_InterimClimateDataRecord_**Leaf Area Index**

LSASAF_InterimClimateDataRecord_**NormalizedDifferenceVegetationIndex**

LSASAF_NearRealTime_**LandSurfaceTemperature**

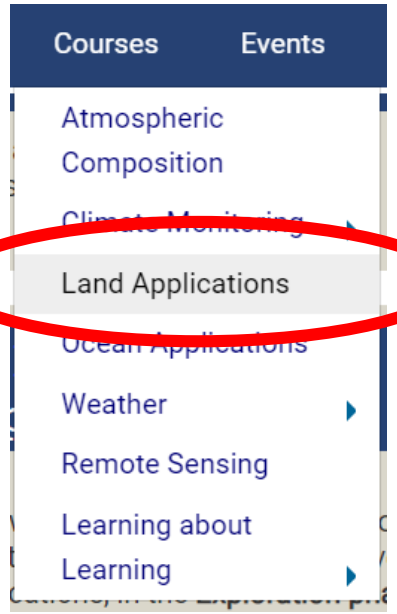
LSASAF_NearRealTime_**Reference Evapotranspiration**

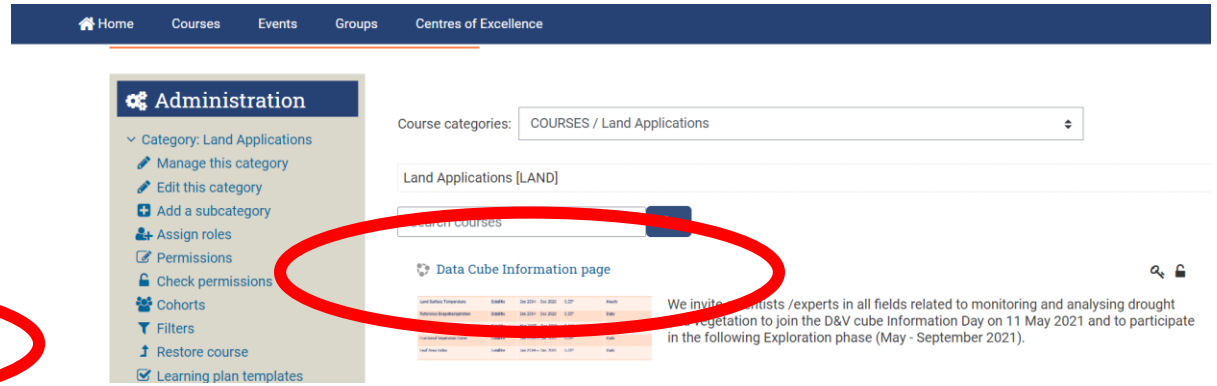
Details on all variables and data records on the D&V Cube Page (Moodle):
→Fact Sheets for quick info
→Full Guide for detail

Information on the Drought & Vegetation Cube

- D&V Cube Page (moodle course)
  - Information on the Variables
  - Description of the methods applied to create the cube

training.eumetsat.int





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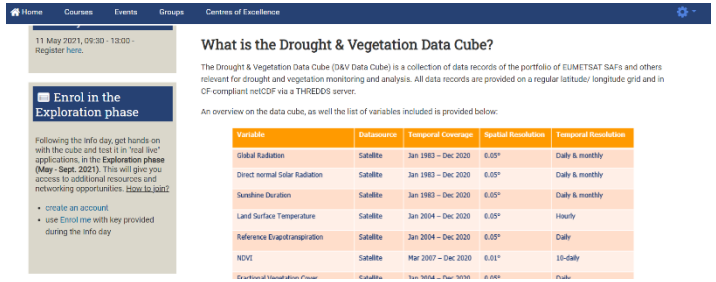

Questions??