A Near Real Time Monitoring System with CSPP for Mountain Regions

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EURAC, Bolzano, Italy

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Overview

- The EURAC Institute for Applied Remote Sensing
- Receiving Antenna & Ground Segment
- Workflow and Near Real Time performance
- Examples and results
- Outlook – To Do

EURAC Institute for Applied Remote Sensing Technologies for Environmental Monitoring

Institute - Team

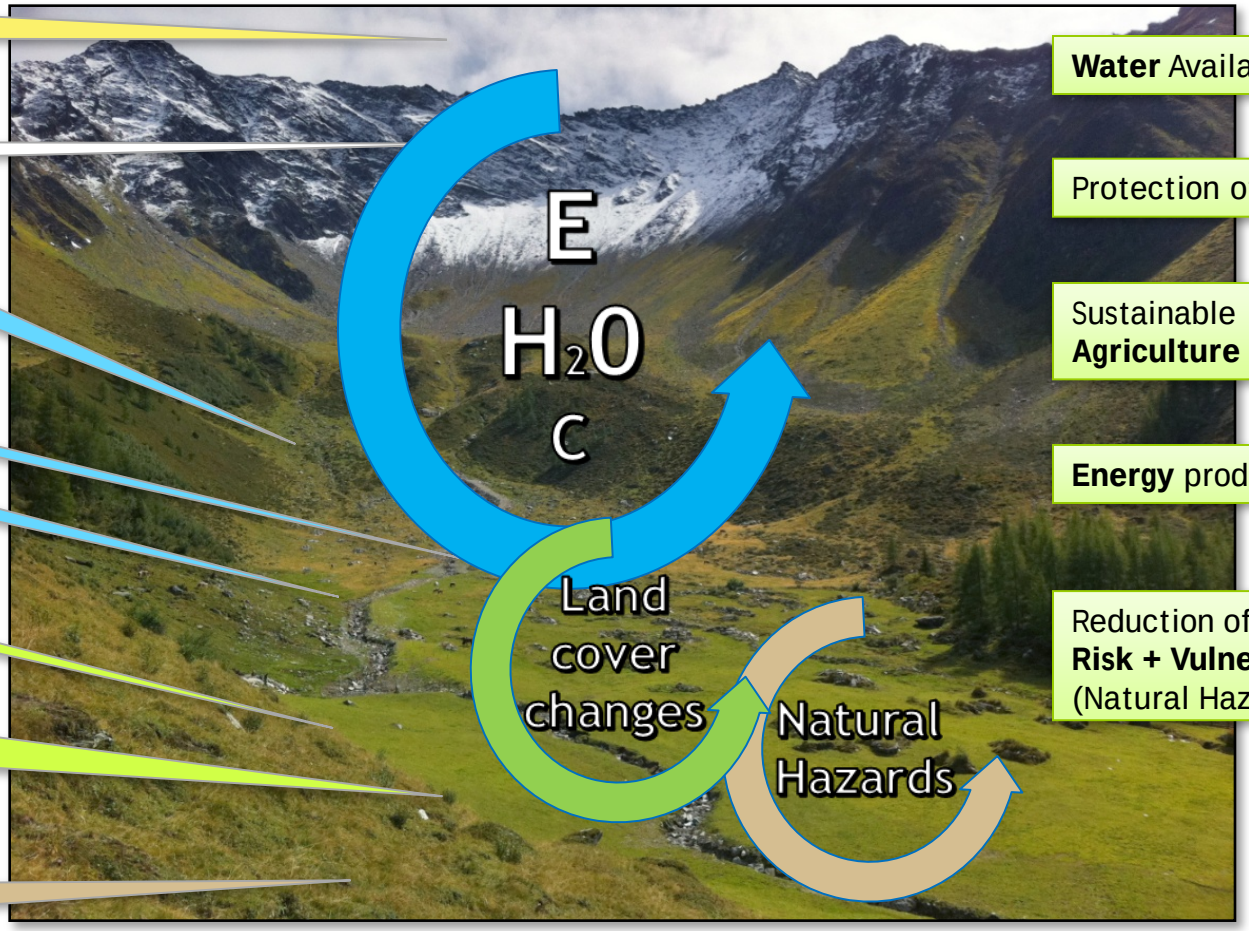
Mission

- integrated **environmental monitoring** and assessment
- of **mountain** regions
- **fusing remote sensing** techniques with **interdisciplinary** approaches

Integrated Environmental Monitoring

Climate (Change)

Key Environmental Parameter and processes



- *Solar Radiation*
- *Snow Cover*
- *Evapo-transpiration*
- *Run-off*
- *Soil Moisture*
- *Land Cover*
- *Vegetation Parameters - LAI*
- *Terrain Movement*

- **Water** Availability
- Protection of **Biodiversity**
- Sustainable **Agriculture** + **Forestry**
- **Energy** production
- Reduction of **Risk + Vulnerability** (Natural Hazards, Climate)

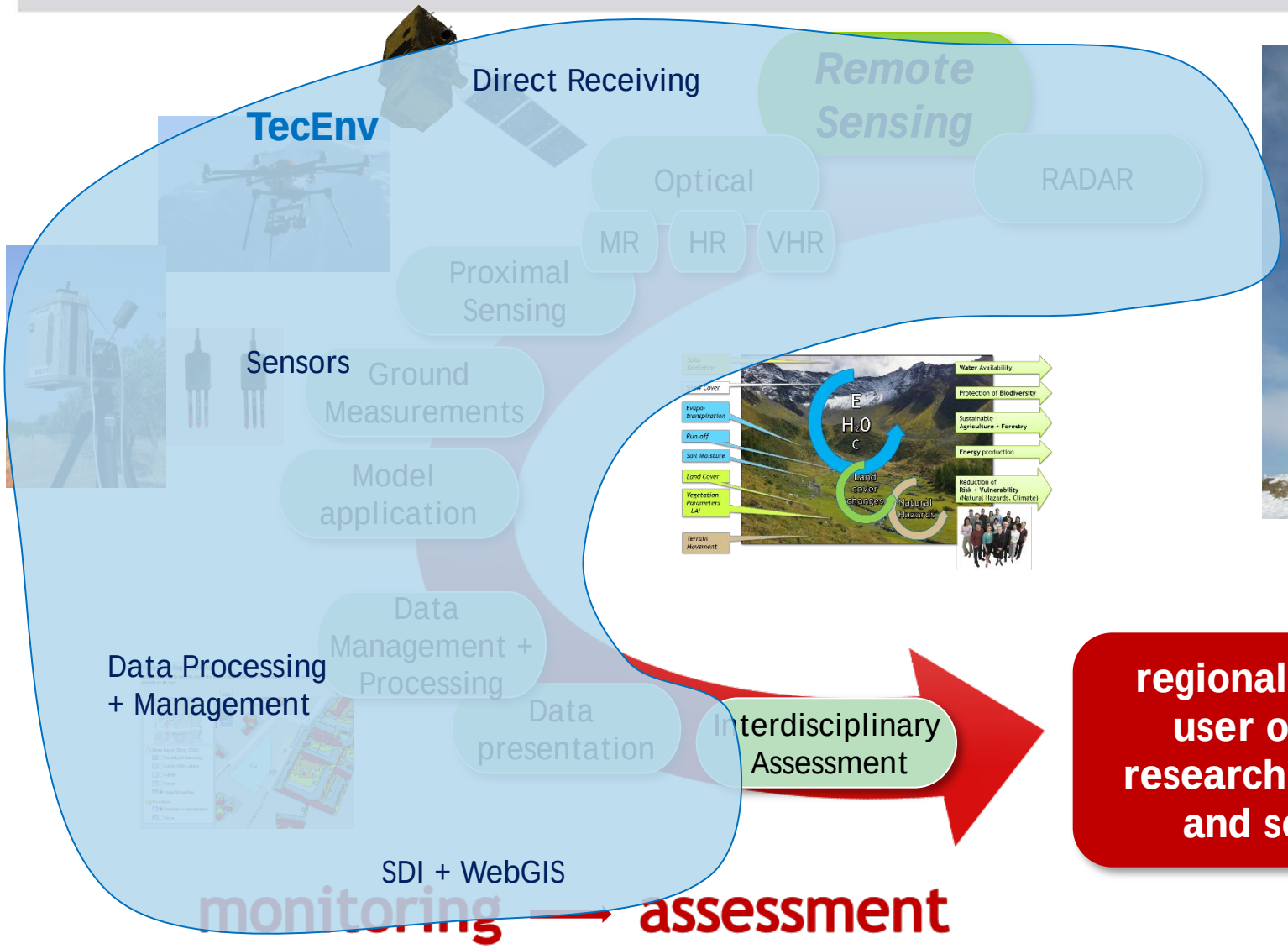
Essential Climate Variables (ECV)

Terrestrial ECV	Observing System (i.e. ESA, others)
River Discharge	In situ networks,
Water Use	In situ networks, regional remote sensing activities
Groundwater	In situ networks,
Lake and Reservoir Levels & Volumes	In situ networks, regional remote sensing activities
Snow Cover	GLOBSNOW
Glaciers and Ice Caps	GLOBGLACIER
Permafrost	Regional activities (i.e. circum-arctic)
Albedo and Reflectance Anisotropy	GLOBALBEDO
Land Cover	GLOBCOVER, MODIS land cover
Fraction of Absorbed Photosynthetically Active Radiation (FAPAR)	GLOBCARBON, MODIS and Seawifs products
Leaf Area Index	GLOBCARBON, MODIS products
Biomass	Regional activities, e.g. Siberia
Fire Disturbance	Several global products from AATSR or MODIS
Soil moisture	SMOS satellite mission

GCOS GLOBAL CLIMATE OBSERVING SYSTEM

(Herold&Wulder, GOFC-GOLD)

Integrating approaches



regional adapted, user oriented research, products and services

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Mountain extreme environment

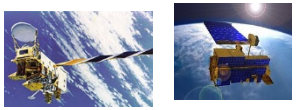
Receiving Antenna & Ground Segment

- Operative since 2009.
- Receiving Station located in South Tyrol in a free obstacle site at 2260 m a.s.l. (Peak of Renon)
- EURAC Ground Segment (GS) in Bolzano manages, processes and archives broadcasted data.
- Visibility mask: all Europe and North Africa
- Ingestion system Thales Alenia and ACS systems

Technical specifications:

- 5,2 m Seaspace antenna dish
- X Band, primary focus configuration
- G/T 28.37 dB/K at 5 degrees elev.
- Satellites and Sensors
  - Terra: MODIS
  - Aqua: MODIS, AMSR-E, AMSU-A, HSB, AIRS
  - S-NPP: VIIRS, ATMS, CrIS, CERES, OMPS

Receiving Antenna & Ground Segment



AQUA TERRA

MODIS

Mission Scheduler + Local Archive

VIIRS

S-NPP

Tape Library

MODIS processing chain (L1B, L2)

Core DB and Job Scheduler

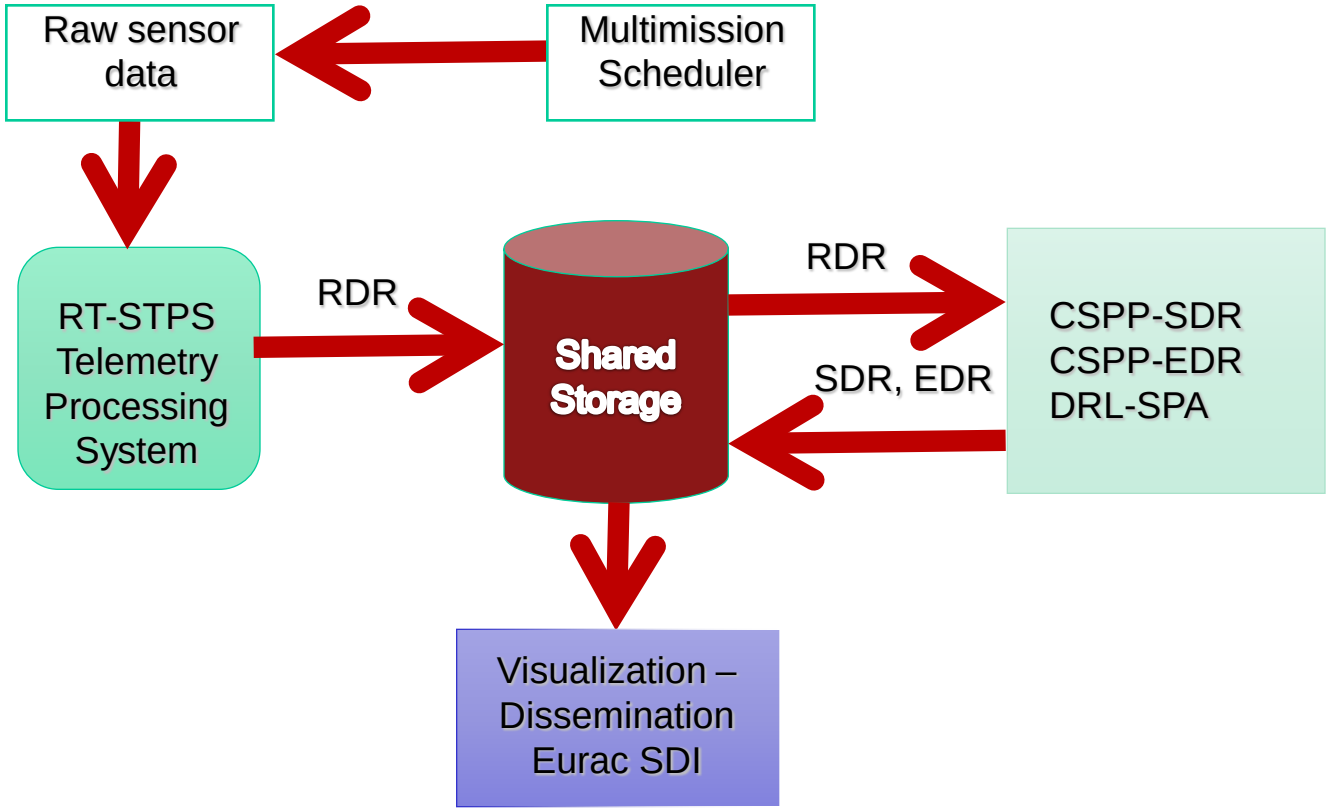
NPP processing chain (RDR,SDR,EDR)

EURAC products Based on MODIS and VIIRS

DES Data Exchange Server distributes products to the users

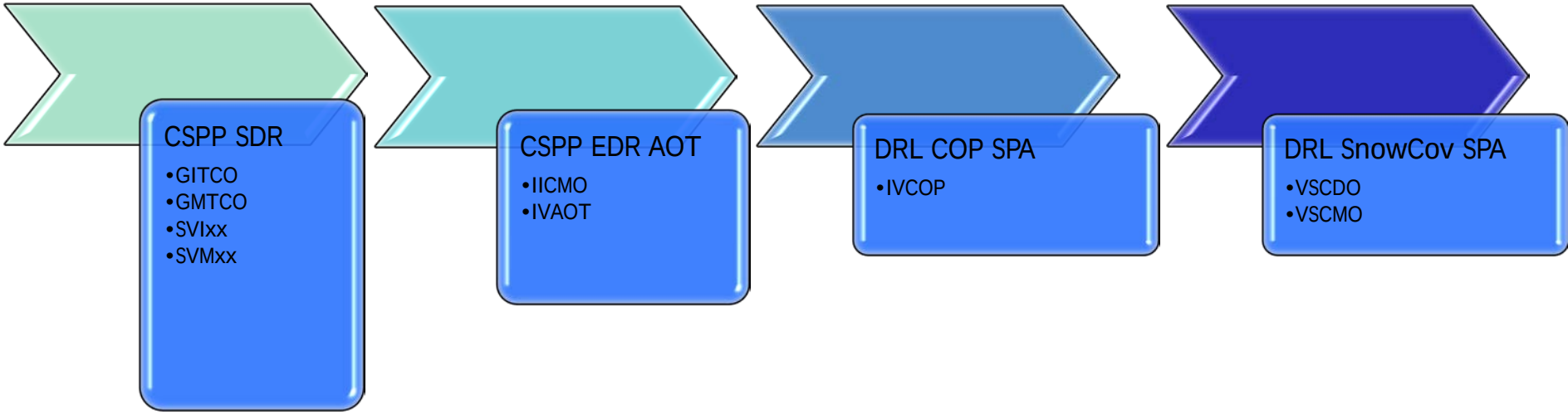
EURAC SDI OCG Services Metadata Catalog

NPP data production using CSPP SW



VIIRS Snow Workflow

Combining CSPP with DRL SPAs

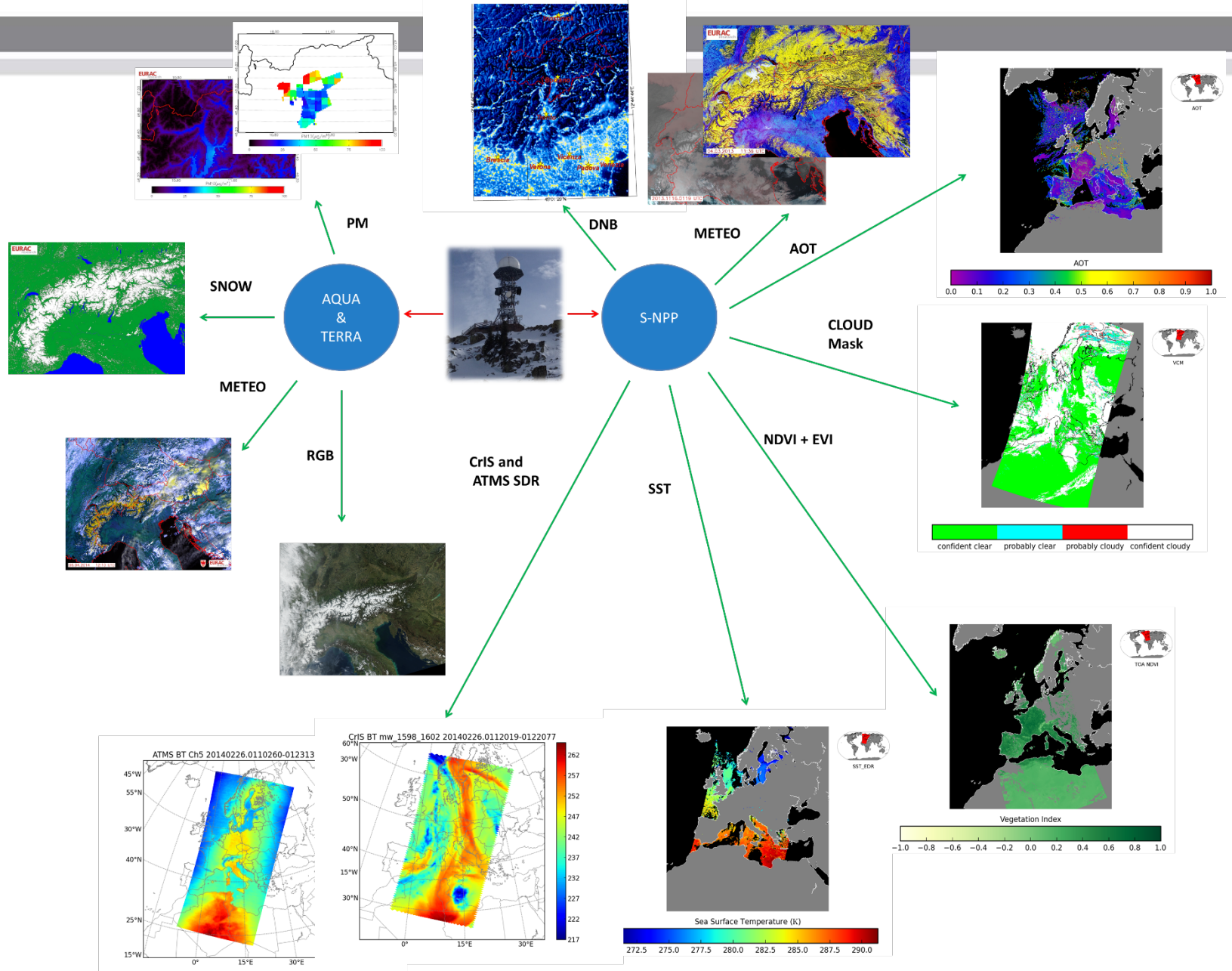


NRT production of VIIRS EDR

EDR production wit parallel CSPP

- RDR in 5 min (RT-STPS)
- CSPP-SDR using 6 cores:
  - 5 min with pre-downloaded ancillary
  - 10 min with ancillary download
- CSPP-EDR with 6 cores:10 min + SPA Production (± 10 min)
- + EURAC EDR

Near Real Time EURAC products



Products and Services

snow cover

- SNOW_daily ALPS
- SNOW_daily EUROPE (in dev.)
- SNOW_cover duration_yearly ST
- SNOW_cover_8d Composite ALPS
- SNOW_cover_16d Composite ALPS

clouds

- Daytime image highlighting clouds and snow for ALPS Res. 500m
- Night-time image highlighting clouds for ALPS Res. 1 Km

air quality

- PM_composite ST
- PM_ground ST
- PM_assimil ST
- PM_composite ER

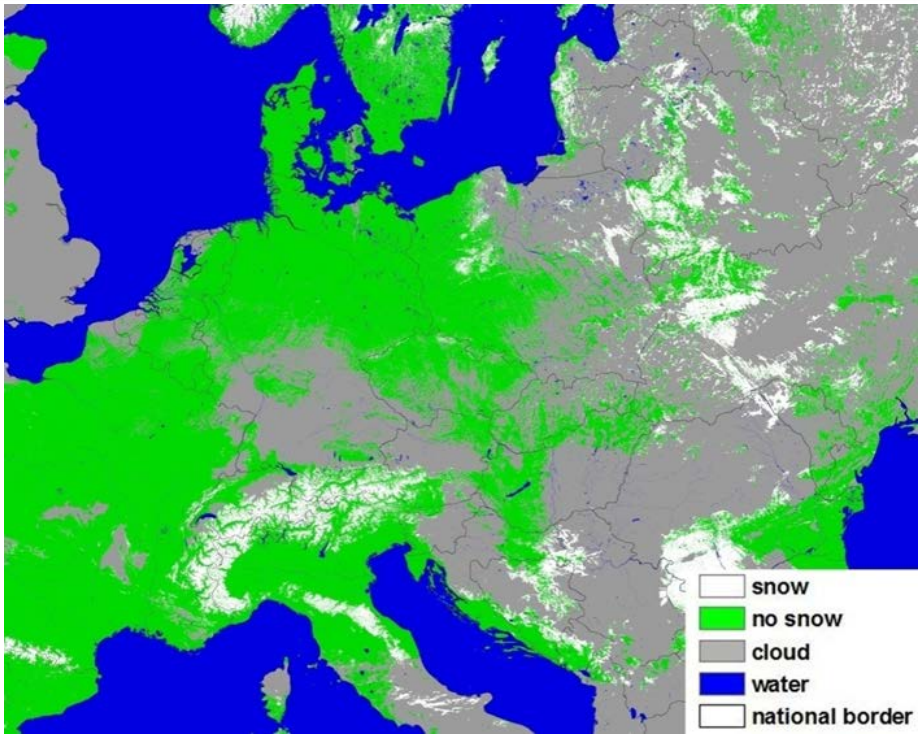
other

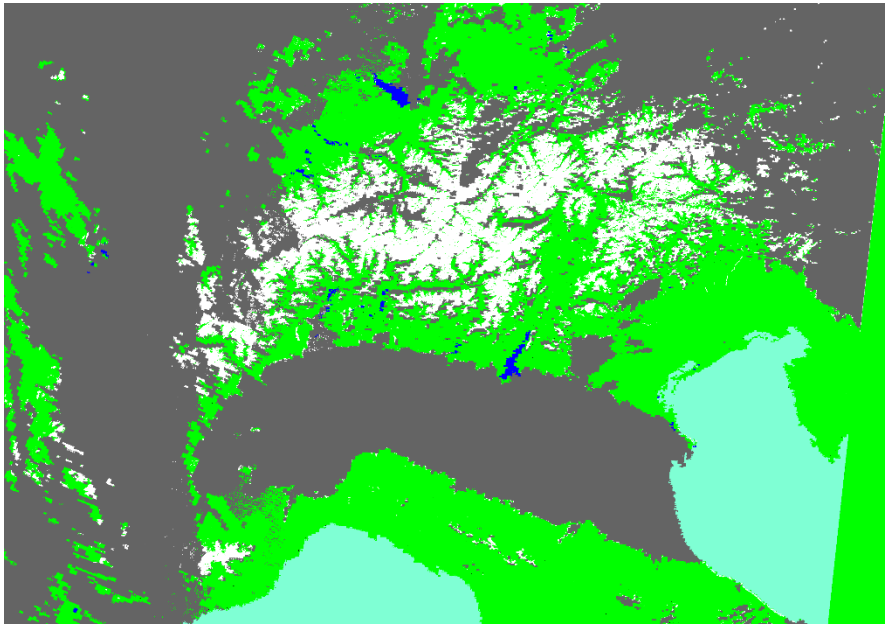
- RGB
- Fire
- VIIRS_NRT

EURAC Snow Map (Modis)

The algorithm exploits only the 250 m resolution bands of MODIS in the red (B1) and infrared (B2) spectrum, as well as the Normalized Difference Vegetation Index (NDVI) for snow detection, while clouds are classified using also bands at 500 m and 1 km resolution.

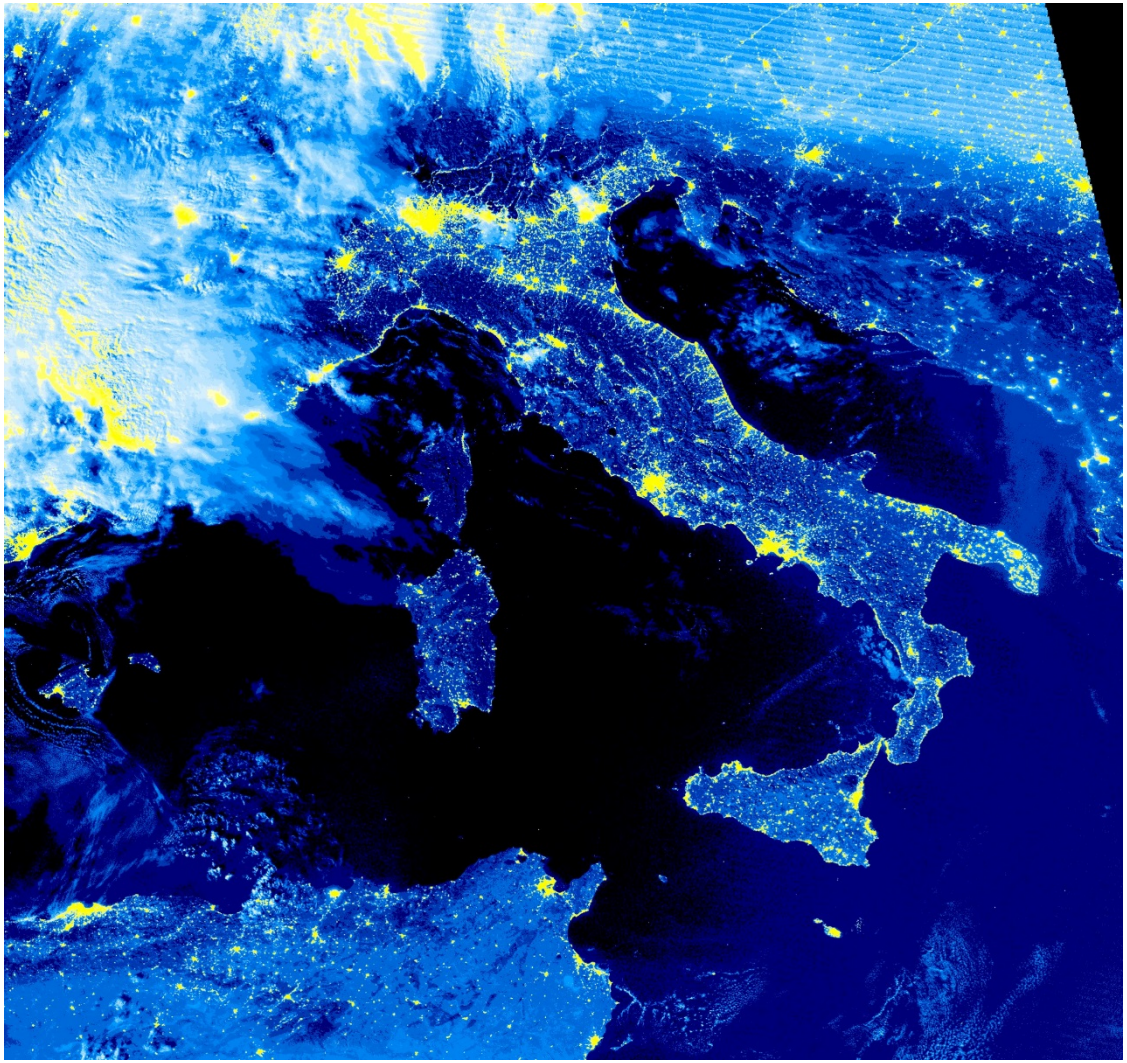
Daily Snow Maps are published on EURAC WebGIS



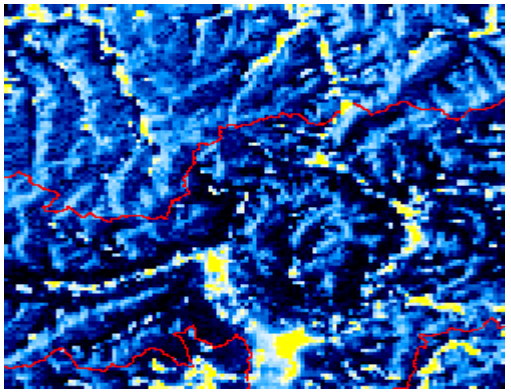


snow
cloud
no snow
ocean
inland water
no data

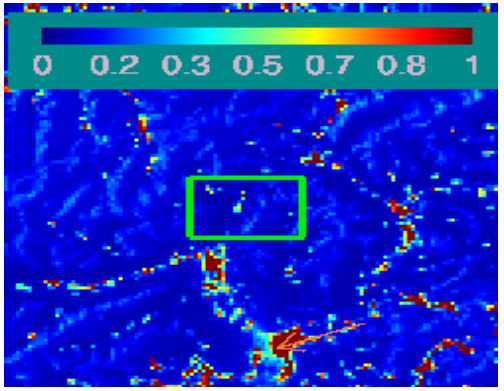
VIIRS EDRs: DNB product



Example of DNB product

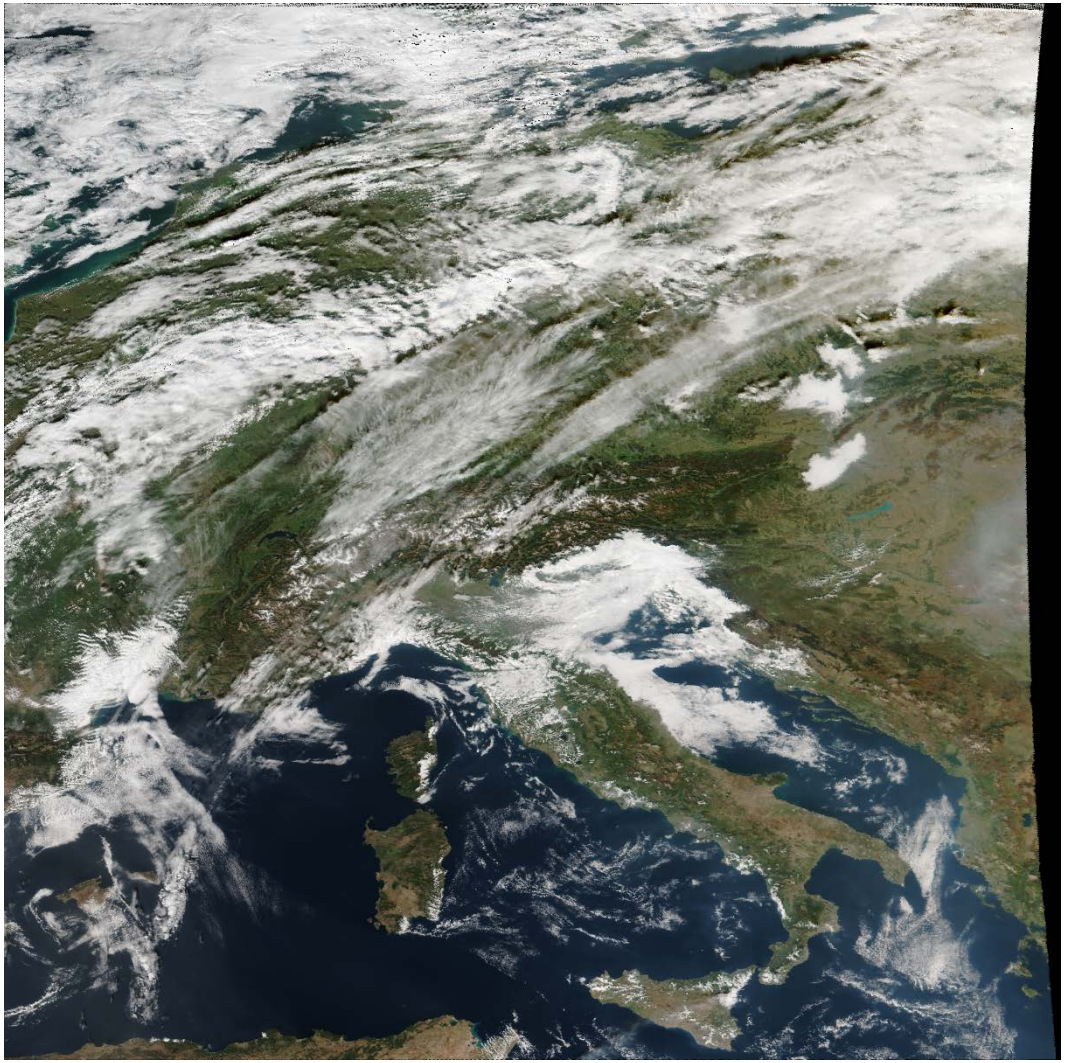


DNB on South Tyrol



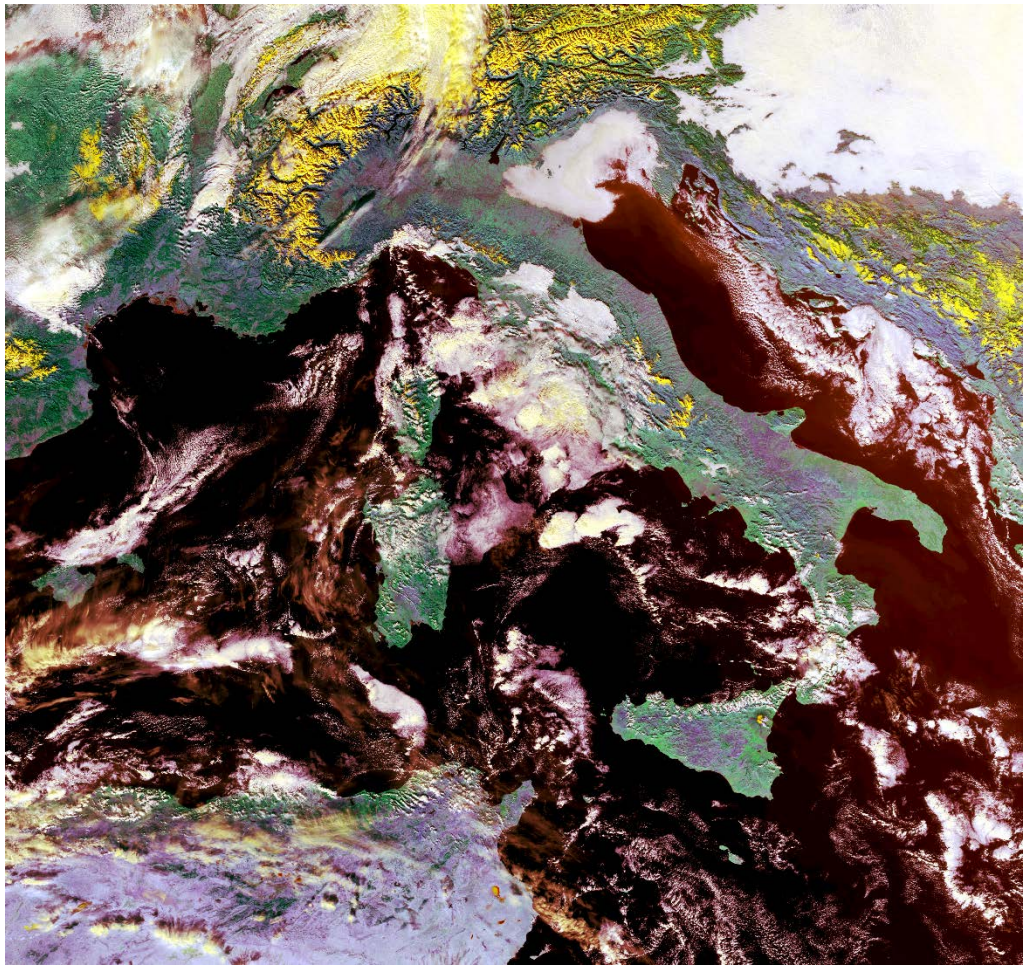
Normalized radiance

VIIRS EDRs: RGB



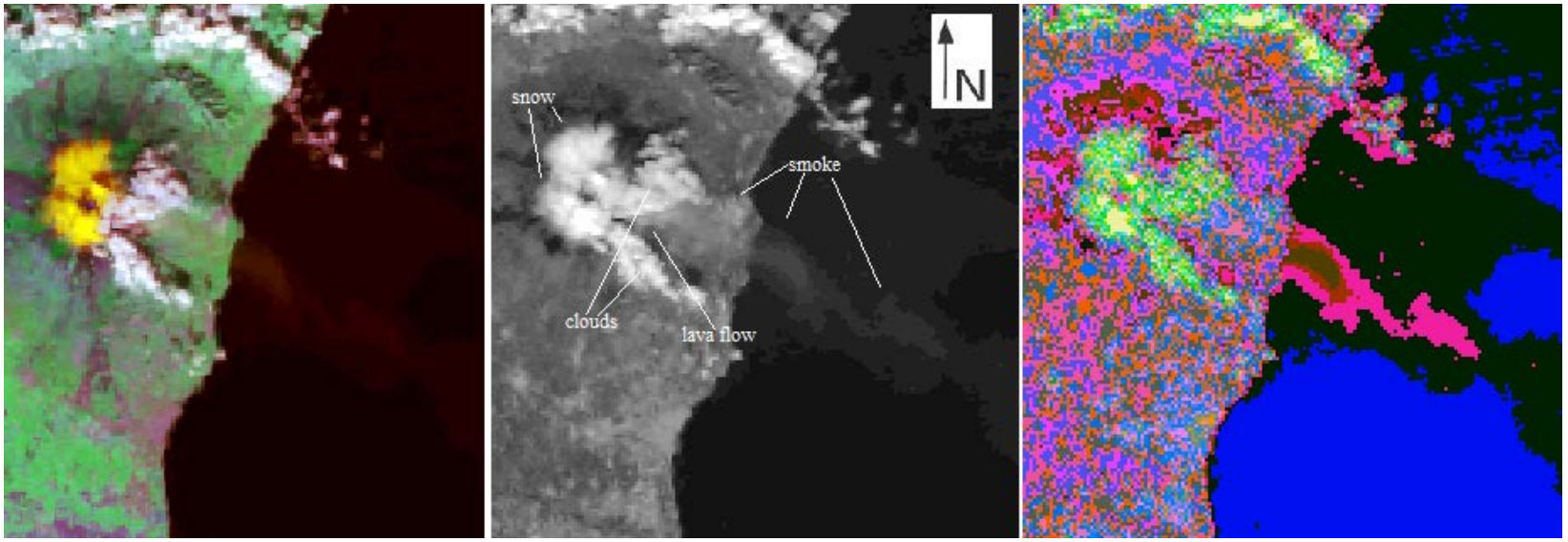
Example of VIIRS RGB

VIIRS EDRs: ETNA eruption (Cloud)



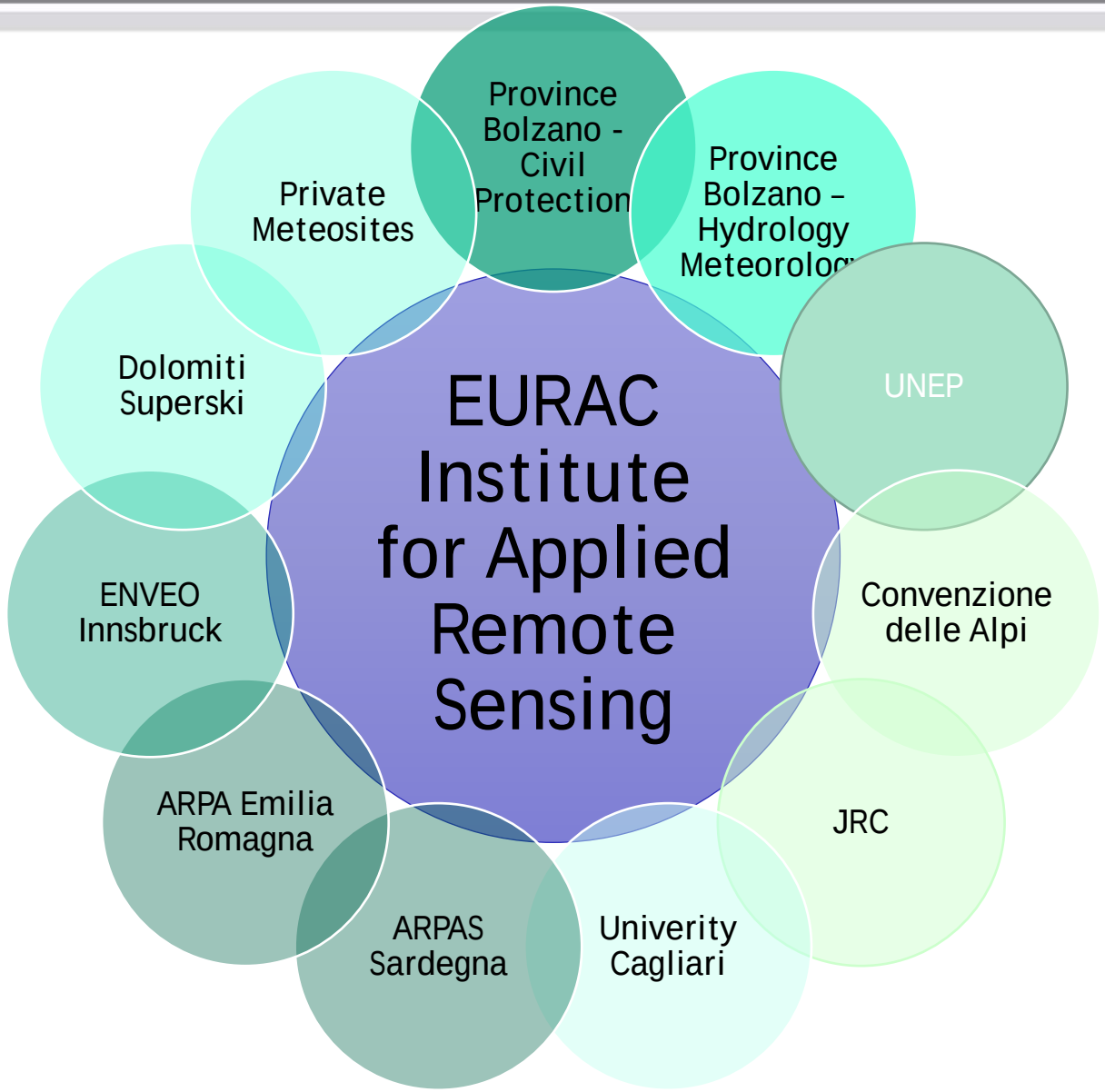
RGB false colour (bands I1, I2, I3)
during Etna eruption 14th December
2013

VIIRS EDRs: ETNA eruption



Zoom on the Etna volcano area. Here on the Red band (center) a different color table has been applied to better put in evidence the column of smoke and hash hurled by Etna.

Users


Province Bolzano - Civil Protection
Province Bolzano – Hydrology Meteorolo
Private Meteosites
Dolomiti Superski
UNEP
EURAC Institute for Applied Remote Sensing
ENVEO Innsbruck
Convenzione delle Alpi
ARPA Emilia Romagna
JRC
ARPAS Sardegna
Univerity Cagliari

SDI (Spatial Data Infrastructure)

- Simplify data exchange and concurrent access
- Improve data availability
- Minimize data redundancy
- Organize spatial data
- Compliant to standards (OGC, INSPIRE, ISO)
- Consolidated data storage and sharing
- Catalog for efficiently searching data (metadata)
- GIS Desktop applications can use WMS and WFS services for data acquisition

Outlook – To do

- Outlook – To Do
  - ✓ Guarantee environmental monitoring continuity from MODIS
  - ✓ Adaptation to S-NPP data of EURAC products based on MODIS data
  - ✓ Operative NRT chain for NPP (already tested) using CSPP software
  - ✓ Consolidation eomount.eurac.edu dissemination portal (SDI and WebGIS FW)

EURAC research

Thank You

www.eurac.edu

http://webgis.eurac.edu

http://eomount.eurac.edu