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Atmosphere Monitoring Service
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News from CAMS Radiation Service – the Probabilistic Cloud Retrieval APOLLO_NG

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CAMS services

The atmosphere service of Copernicus (CAMS) combines

- state-of-the-art atmospheric modeling of atmospheric constituents (including aerosols and water vapour) and
- Earth observation data to provide information services

It focuses on

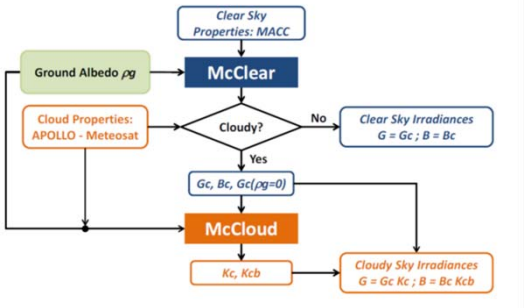
- European air quality
- global atmospheric composition
- climate,
- and UV and solar energy

Copernicus was previously known as GMES (Global Monitoring for Environment and Security) and the precursor project for CAMS was the MACC project series.

The Heliosat-4 Method

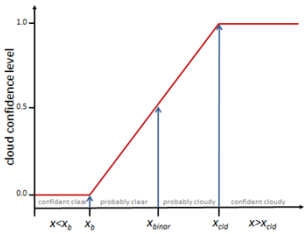
Cloud properties from satellites

- APOLLO (Avhrr Processing scheme Over Land, cLouds and Ocean, Saunders & Kriebel, 1988) ➔uses AVHRR heritage channels (0.6, 0.8, 1.6/3.9, 10.8, 12µm)
- Five different cloud tests (Dynamic visible test, infrared gross temperature test, shortwave reflectance ratio, spatial coherence test, brightness temperature difference)
- Cloud mask decision: bit adding scheme of fixed thresholds



APOLLO_NG probabilistic cloud detection

- APOLLO_NG (APOLLO next generation, Klüser, Killius & Gesell, 2015) : Recent update of APOLLO
- Probabilistic interpretation of each APOLLO cloud test
- Subsequent update of cloud probability after each individual cloud test
- Cloud probability threshold for cloud mask decision can be set individually

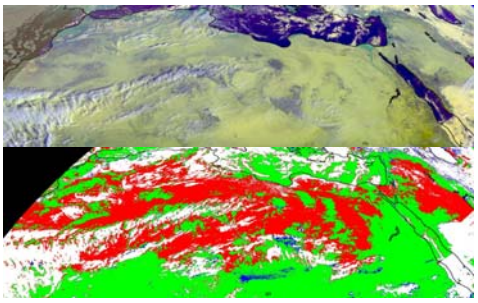


Cold, bright desert surface: APOLLO_NG performs better

- Example scene: 15. January 2008 08:00 UTC

RGB composite

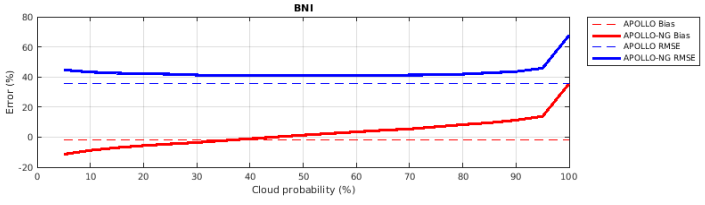
		Old APOLLO	
		Cloudfree	Cloudy
APOLLO_NG	Cloudfree		
	Cloudy		

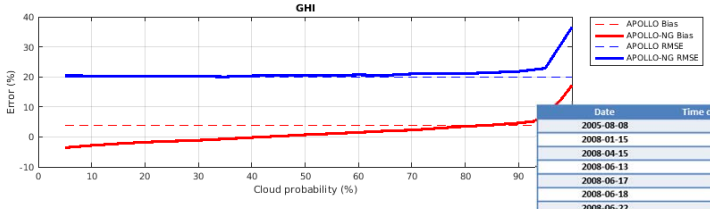


Cloud mask comparison p_{thresh} = 40%

First validation results

- APOLLO vs. APOLLO_NG cloud properties as Heliosat-4 input
- Temporal resolution: 15 minutes
- APOLLO_NG reduces bias of direct and global irradiances
- Comparison against ground data from Plataforma Solar de Almeria (PSA), and seven Baseline Surface Radiation Network (BSRN, Ohmura et al., 1998) stations
- Days evaluated so far: see table on the far right. Database grows constantly in size





Date	Time of observations (UTC)
2005-08-08	02:15-21:45
2008-01-15	02:15 – 21:45
2008-04-15	02:45 – 21:15
2008-06-13	02:15 – 21:45
2008-06-17	02:15 – 21:45
2008-06-18	02:15 – 21:45
2008-06-22	02:15 – 14:00
2008-07-03	02:30 – 21:45
2008-08-15	02:30 – 21:30
2008-10-15	02:45 – 21:15
2009-01-04	02:45 – 21:15
2013-07-15	02:15 – 21:45
2013-10-15	02:30 – 21:30

References

- APOLLO_NG reference:
  Klüser, L., Killius, N., & Gesell, G. (2015). APOLLO_NG–a probabilistic interpretation of the APOLLO legacy for AVHRR heritage channels. Atmospheric Measurement Techniques, 8(10), 4155-4170.
- Copernicus Atmosphere Monitoring Service (CAMS) website, http://atmosphere.copernicus.eu/
- Direct acces to services:
  http://www.soda-pro.com/web-services/radiation/cams-radiation-service.
- User's Guide at CAMS website
- Heliosat-4 reference:
  Qu, Z., A. Oumbe, P. Blanc, B. Espinar, G. Gesell, B. Gschwind, L. Klüser, M. Lefévre, L. Saboret, M.Schroedter-Homscheidt, L. Wald, Fast radiative transfer parameterization for assessing the surface solar irradiance: The Heliosat-4 method, Meteorologische Zeitschrift, 2016, in press.
- Ohmura et al., 1998, B. Am. Meteorol. Soc., 79, 17
- Original APOLLO reference:
  Saunders, R. W., & Kriebel, K. T. (1988). An improved method for detecting clear sky and cloudy radiances from AVHRR data. International Journal of Remote Sensing, 9(1), 123-150.

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