TEN-DAILY GLOBAL COMPOSITES OF METOP-AVHRR

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1. INTRODUCTION

The history and applications of the AVHRR-sensor (Advanced Very High Resolution Radiometer) on board of the series of the US NOAA-satellites has been thoroughly documented by Cracknell [1]. Originally designed for meteorological purposes and to complement the equatorial view of the geostationary GOES-platforms, the NOAA-satellites follow a standard, near-polar orbit. With its wide swath of 2920 km, the AVHRR sensor is capable to provide synoptic imagery with daily global coverage, be it only at a nadir-resolution of 1.1 km [2]. Beyond the meteorological context, the synoptic AVHRR imagery soon proved very useful as well for the monitoring of the land surfaces at continental to global scales. Stimulated by this new information, the research on global vegetation dynamics bloomed and numerous studies brought new insights on the distribution of ecosystems and their susceptibility to changes caused by climatic and human factors (see for instance [3] and [4]). The NOAA-AVHRR system also had some technical shortcomings, to name just a few: the poor stabilisation of the platform, the lack of measures against orbital drift (retarding overpass times) and the absence of an on-board shortwave calibration standard. But especially the limited on-board data storage facilities hampered the production of global composite images at 1 km resolution, because most of the 1 km information was definitely lost if not registered in real time (and stored) by a local ground receiving station. The VEGETATION sensor, carried since 1998 by the European satellites SPOT-4/5, continued with the lessons learned from twenty years of operation of NOAA-AVHRR. It tried to keep the positive elements, especially the daily global coverage at 1 km resolution, but without the mentioned drawbacks [5, 6]. All the land data registered during a single orbit are stored on board and transmitted to the antenna of Kiruna in Northern Sweden. The further processing,

archiving and data dissemination is performed by VITO's centre for image processing. The global 10-daily syntheses (S10) are by far the main product demanded by the user community. The S10 are composite images, which comprise calibrated and atmospherically corrected reflectances (incl. NDVI), projected to a geographical Longitude/Latitude grid with a resolution of 1°/112 (roughly 1 km along a great circle).

2. METHODOLOGY & RESULTS

However, by the end of 2012 SPOT-5 is expected to be at the end of its life cycle. Therefore, alternatives should be put in place. On 19 October 2006, the European Space Agency (ESA) and the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) launched the METOP-satellite, which can be considered as the European counterpart of the NOAA-platforms [7]. METOP carries a wide range of different sensors, amongst which also the same AVHRR-instrument as installed on NOAA. Contrary to NOAA, METOP provides advanced on-board data storage capacities, so all the registered 1 km imagery of the last orbit is systematically transmitted (via the Svalbard antenna) to EUMETSAT. After some first adaptations (pre-processing steps), EUMETSAT distributes the "raw" data freely and in near-real time via its EUMETCast broadcasting service [8]. The entire system became operational from 15 May 2007 onwards. Although the action initially focused on the European continent, the METOP imagery soon revealed its excellent potentials for global land monitoring. Therefore VITO decided to start the routine processing of the METOP-AVHRR data on a global scale. The resulting 10-daily composites can be considered as a complement to the global S10, derived from SPOT-VEGETATION. They contain the following image layers:

- Surface reflectances in RED, NIR and (if band3A) SWIR
- Brightness temperatures BT4, BT5 and (if band3B) BT3
- Derived scenes with surface NDVI and surface temperature (land and sea surface temperatures merged in the same image)
- The four angles of the viewing geometry (zenith/azimuth angles of sun and sensor, as seen from the pixel centres)
- Status BitMask: land/sea, clear/non-clear, cloud/snow&ice, etc.
- Time grid: Registration day of the selected observation
- Nr. of "clear" (cloud/snowfree) observations available for the compositing

- ID of the segment from which the observation was extracted. This ID forms the entry to the associated "segment database" which contains all the relevant information on the concerned segments.

In the end, VITO will dispose of a full time series starting in January 2008 and new decades will systematically be added in near-real time. In parallel, a centralised data distribution service is being established which allows users to download specific products for free. According to the current planning, the entire service is expected to become operational early 2010. The pre-processing steps executed by EUMETSAT and the processing chain developed at VITO will be explained in detail in the full paper.

3. REFERENCES

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