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TAKE FIVE EXPERIMENT : USING END OF SPOT4 SATELLITE OPERATIONAL LIFE FOR SIMULATING THE FUTURE SENTINEL-2 MISSION

Abstract

This paper presents TAKE5 experiment, based on the use of SPOT4 after the end of its commercial mission and before disposal. TAKE5 is an expanded mission for SPOT4, shaped to provide time series of optical images to simulate the repetition and the wide area coverage of Sentinel-2 images.

Sentinel-2 constellation will induce new methods for monitoring land surfaces using remote sensing since from 2016 onwards and for 7 year period, it will produce a great number of images (5-day repeat cycle), and cover wide areas (images of 300*300km). New methods and algorithms have to be developed to exploit images acquired over wide territories with variations in climate and land cover, and polluted by clouds. Moreover, automated methods are mandatory related to the amount of images available.

Therefore, a realistic simulation of Sentinel-2 products is of great interest to prepare methods and algorithms. Simulated images have been created (hyperspectral simulation, Landsat or Formosat-2 images), but none of those attempts simultaneously combined the large areas and revisit properties of Sentinel-2 mission. SPOT4 resolution and on-ground coverage are quite similar to those of Sentinel-2 constellation so when CNES offered to use SPOT4 for short-term experiments to be run before the satellite disposal, CESBIO proposed TAKE5 mission which consists in moving SPOT4 to a 5-days cycled orbit to simulate images of Sentinel-2 constellation.

A 6 month feasibility study was necessary to ensure SPOT4 orbit could be changed while complying with 2 constraints :

- handle the new mission using the systems developed for the commercial mission (cost issue)
- respect CNES end-of-life policy for low orbit satellites launched before Dec 11th 2010, which specifies removal of satellites from orbit after use

SPOT4 reached its new orbit on Jan 29th 2013 and CNES started TAKE5 mission 2 days later for 4 months. During this period, time series of SPOT4 images were acquired every 5 days using 42 sites scattered over nearly all continents. Several space and research agencies (ESA, NASA, CCRS, JRC) also contributed to the mission by funding the cost for edition of products acquired on sites they selected among the 42.

This paper describes the operational aspects of TAKE5. The contents of the feasibility study and the initial constraints will be presented firstly. Secondly will be presented the operational organization for preparing and running TAKE5. Finally, the paper will assess the results of SPOT4 exploitation as "TAKE5", through performances reached and lessons learned.