The strategy of the COSMO-SkyMed mission over the polar regions

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The polar regions are extremely important in terms of their global impacts on weather and climate and functioning of the Earth system. In addition to this, human presence and related activities are increasing in these regions. Focus of this paper is to show the strategy of the COSMO-SkyMed (Constellation of Small satellites for Mediterranean basin Observation) mission in terms of potentiality and opportunity offered to the user community for climate change study, cryosphere environment monitoring and developing of operative services in polar areas.

COSMO-SkyMed is an Earth Observation (EO) Dual-Use (Civilian and Defence) Space System based on a co-planar constellation of 4 mid-sized SAR (Synthetic Aperture Radar) satellites, fully operational from 2011. It has been designed to face international partnerships and integration of the system itself into a multi-mission framework of cooperating multi-sensor systems. In the polar regions, due to its sun-synchronous orbit, the COSMO-SkyMed constellation can offer opportunities in terms of revisit time and coverage of large areas, like in the case of the north-east and north-west pass covered in only 24 hours.

Sea ice monitoring is required by a wide spectrum of users (Authorities and privately held companies) operating at high latitudes, including for navigation (rivers, lakes and sea) and offshore operations. EO Satellites and in particular SAR instruments represent a reliable tool for ice monitoring because they are able to provide a synoptic view that complements the accurate but low coverage reports from ships and airborne sources. SAR data are able to provide information on the ice coverage, the size and shape of ice floes. In particular, SAR images provide the crucial advantage of a weather-independent, day–night imaging system, in the glacier environments where persistent clouds continue to hamper data acquisitions by visible imagers and where the polar night imposes a prolonged period of darkness. In addition, timely and variable information on sea ice conditions are essential for all operations in ice-covered areas, in fact the safety and efficiency of sea transportation, offshore operations, fisheries and other activities in regions covered by sea ice require high-resolution and ice forecasts. On arctic lands SAR can provide monitoring of land instability due to permafrost thawing and melting. One of the services required is the Ice Charting, were high resolution SAR data could make a significant contribute. These are only few examples of the potentialities of the COSMO-SkyMed SAR data in the framework of the exploitation of EO data on polar regions. In order to support the recent needs for ice sheet applications, a specific acquisition plan has been reorganized and expanded over Antarctica and Greenland in the framework of COSMO-SkyMed Background Mission (BCK Mission). This low priority acquisition plan, started in 2011, represents a great opportunity for user community: it is exploited to perform systematic acquisition plans over specific areas of interest, in order to guarantee measuring continuity and the availability of reference datasets for current and future activities, such as mapping projects, emergency mapping, change detection applications, etc. The areas of interest have been selected collecting the expression of interest related to specific sites and topics coming from the scientific, institutional and commercial community.

Furthermore, ASI periodically issues announcements of opportunities devoted to the scientific exploitation of COSMO-SkyMed data (free of charge) for basic and applied Research & Development (R&D). In this context, two open calls were published on the ASI’s website on February 2015: one of their
objectives is to facilitate innovative ideas for their synergistic utilization with the ESA (European Space Agency) and international EO Missions.
This paper aims to show the usefulness of COSMO-SkyMed data exploitation on polar regions.