

EARTH OBSERVATION SYMPOSIUM (B1)  
Future Earth Observation Systems (2)

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## WEATHER AND CLIMATE MONITORING IN THE ARCTIC REGIONS

**Abstract**

In recent years, the interest in the Arctic regions by various stakeholder has steadily increased with the use of economic, political, military and scientific arguments. Availability of additional shipping routes, the presence of productive fishing grounds and innovative means for resource extraction have resulted in an increased human presence in the high Northern latitudes. Furthermore, the polar regions have a significant impact on the modelling of weather and climate on global level.

Despite its important role, the Arctic region only receives limited satellite-based services. This can be explained by the challenging geometrical conditions for typical satellite missions, resulting in poor performance in the telecommunications, weather monitoring and navigation domains. In order to tackle these challenges, the European Space Agency (ESA) is currently investigating the Joint Arctic Mission (JAM). JAM will be a synergetic mission aiming at providing telecommunications, navigation and weather monitoring services to the Arctic regions. For this purpose, JAM will consist of two spacecraft, which will be inserted into a High Elliptical Orbit (HEO) at 63.4 inclination with an 18 hour orbital period. Such an approach strongly resembles the well-known Molniya systems and is an effective method of covering the Arctic region, as the spacecraft will spend a significant part of its orbital period in the apogee region with access to the high latitudes.

For the weather monitoring service, the spacecraft will be equipped with the so-called Hosted Arctic Imager (HAI), which is currently investigated in frame of ESA's Polaris programme. HAI is intended to fulfill the needs in weather and atmospheric observations in the Arctic regions, as they have been identified by the World Meteorological Organization (WMO). As such, HAI will be responsible for providing similar services, which consist of near-real-time observations of Atmospheric Motion Vectors of the Arctic polar region, as its Meteosat counterparts in GEO, such as SEVIRI on MSG and FCI on MTG.

In this paper, the overall programmatic context of the Joint Arctic Mission and services for the polar regions will be discussed with a focus on weather and atmospheric observations. For this purpose, the mission needs and observational requirements and conditions for the Hosted Arctic Imager will be analysed. Identified challenges, candidate solutions and engineering results for the mission analysis and high-level instrument design will be presented. This discussion will be complemented with an outlook on the programmatics for the Hosted Arctic Imager and the Joint Arctic Mission.