

IAF EARTH OBSERVATIONS COMMITTEE (EOC)

1. Introduction/Summary

The free of charge policy of the COPERNICUS programme is growing Earth observation (EO) data exploitation not only by public use but also in the commercial sector. In parallel, crises such as the covid pandemic, climate change and the war in Ukraine are fueling demand for geospatial information. Whilst the first two challenges strengthened international cooperation, especially in Earth observation, the war in Ukraine has severe effects on international collaboration in space science and space operations and put the importance of information dominance on full display. Media have made extensive use of commercial satellite imagery to document the situation in Ukraine and agencies have started to use free & open EO data to monitor the environmental and humanitarian impacts of the war. Earth observation represents today an intense international contest with billions of dollars at stake in the government and commercial sectors. The number of Earth observation satellites has expanded fivefold since 2012, with additional increases anticipated for the foreseeable future. As more satellites reach orbit, the era of persistent surveillance approaches. The most noteworthy developments from November 2021 through May 2022 are highlighted.

2. Latest Developments

Satellites are adopting more and more powerful computers and on-board processing units

Traditionally, electro-optical imagery and synthetic-aperture radar data have been sent to the ground for processing. New Earth-observation sensors continue expanding the volume of data acquired in orbit, driving the need to package and pre-process data more efficiently ("edge computing") in order to effectively reduce the amount of time that is required for downlink and allow basic information to be used for

in-orbit tasking. All these technologies (on board and on ground) are optimizing and improving the delivery of the information near real-time to the users.

Landsat-9 and NOAA (US)

After launch on 27 September 2021, Landsat 9 transitioned into its operational phase on 31 January 2022. Following internal data system readiness reviews, USGS began making data fully and freely available to external users on 10 February 2022. NOAA's GOES-T (now GOES-18) launched on 1 March 2022. It is the third in a series of four advanced geostationary weather satellites, carrying the same instruments as its predecessors GOES-R (GOES-16) and GOES-S (GOES-17).

ASI/ThalesAlenia Space COSMO-SkyMed (Italy)

The second generation of Agenzia Spaziale Italiana's COSMO-SkyMed (CSG-2) operational with the first satellite launched on 18 December 2019 was joined by the second, launched 1 February 2022 enabling CSG2 to observe the same points on Earth twice a day. CSG2 was developed by Thales Alenia Space Italy, as prime contractor, for the Italian Space Agency (ASI) to provide operational continuity for the original COSMO-SkyMed constellation, which consisted of four small satellites, launched between 2007 and 2010. CSG-3 & -4 are scheduled for launch in 2024 and 2027, respectively.

MDASat-1, first fully developed African satellite (South Africa)

MDASat-1, the three-satellite mini-constellation developed by the South African National Space Agency in collaboration with the Cape Peninsula University of Technology, was launched on 13 January 2022. The launch marked a significant milestone for South Africa, as it was the first launch of a satellite developed entirely on the African continent.

RISAT-1A (India)

ISRO successfully launched RISAT-1A (also known as EOS-4), carrying a C-Band SAR instrument. The satellite is designed to provide high-quality images under all-weather conditions for applications such as agriculture, forestry, soil moisture, hydrology, and flood mapping.

Airbus/CNES (France)

France and Vietnam have decided to strengthen their existing space cooperation. Last November (2021), in the presence of French and Vietnamese Prime Ministers, VAST, CNES and Airbus signed a Letter of Intent on cooperation related to Earth-Observation. This cooperation is aimed at facilitating the implementation of the “Vietnam Space Technology Programme 2020 – 2030.” In the frame of the VNREDSat-2 programme, Airbus will work with VAST to define the solution for the future Vietnamese Earth-Observation system including a transfer of technology programme.

Thales Alenia Space

Thales Alenia Space signed a contract with the Italian Space Agency (ASI) to conduct a 9-month feasibility study for the PRISMA Second Generation (PSG) hyperspectral Earth observation system. Leading a consortium including Leonardo, Telespazio, e-Geos and SITAEL, Thales Alenia Space is responsible for the system design and satellite build to support the development of applications like the monitoring of natural resources and atmosphere; regional development; and environmental risks. The South Korean 425 Project radar system will launch in 2022. These high-resolution SAR satellites are being developed by a consortium consisting of Korean Aerospace Industries (KAI) and Hanwha Systems Corp with Thales Alenia Space providing the SAR payload. Thales Alenia Space contributes to five of the six new Copernicus Expansion missions, three as prime contractor (CIMR, ROSE-L, CHIME) and two as payload supplier (CO2M, CRISTAL). These new satellites will be used to **measure** the atmospheric carbon dioxide (CO2) produced by human activity, **monitor** sea ice thickness and overlying snow depth, **provide** improved services for sustainable agriculture and biodiversity management, **observe** ocean behavior, and **support** precision agriculture and food security.

SITAEL

SITAEL and its partners (Thales Alenia Space, Leonardo, Space Engineering) are developing a small class satellite platform in the frame of the ASI National Project PLATiNO. PLATiNO is a brand new all-electric platform in

the mini class with total mass in the range of 150-200 kg (launch), designed to be compatible to a varied range of applications (multi-applicability). The requirements and technological solutions are strictly linked to the multi-purpose high level requirement aimed to serve different mission scenarios. The Avionics Subsystem integrates the OBDH (On Board Data Handling) and the AOCS (Attitude and Orbit Control System) functions. The core of the avionics subsystem is the IPAC (Integrated Processing, Data-handling and AOCS Controller, provided by Thales Alenia Space. The SAR payload on board PLATiNO-1, designed and manufactured by Thales Alenia Space in Italy, is an innovative Micro-SAR, able to image both in passive and active mode, that literally redefines the market performance of this technology. Combined with the high power that the PLATiNO platform can provide, PLATiNO-1 can guarantee up to 5 minutes scan time per orbit, performance unmatched in the Micro-SAR sector, with ground resolution up to 1 meter. PLATiNO 1 will be launched within 2022.

Planet

Planet announced that Planet’s PlanetScope and SkySat data have joined the European Space Agency (ESA) Third Party Missions portfolio, enabling ESA to utilize Planet data for scientific, research, and pre-operational Earth Observation based applications development. Through distribution under the ESA Earthnet Programme, European researchers, scientists, and companies can access Planet’s high-frequency, high-resolution satellite data for non-commercial use.

3. Breakthroughs

Sentinel-6 Michael Freilich: the new Reference Altimetry Mission

Following the project scientists’ recommendation during the last Ocean Surface Topography Science team meeting, on 24 March, CEOS Ocean Surface Topography Virtual Constellation (OST-VC) members declared Sentinel-6 Michael Freilich as the new Reference Altimetry Mission for the worldwide altimetry constellation.

NEXT GENERATION EU

In Italy, within the PNRR (National Plan for Resilience and Recovery), will develop in a short time the IRIDE constellation (optical, hyperspectral and SAR) driven by user requirements defined from National User Forum for the public sector and extended to the commercial sector too.

EnMAP (Germany)

The German Aerospace Centre (DLR) launched the first ever German optical Earth observing satellite, EnMAP, on 1 April 2022. EnMAP carries a hyperspectral imager, with 230 spectral channels in the solar-reflectance range and will acquire data on a frequent basis with high geometric resolution. The major objectives of the mission are to measure, derive, and analyze numerous diagnostic parameters which describe vital processes on the Earth's surface relating to agriculture, forestry, soil and geological environments, as well as coastal zones and inland waters. More information on EnMAP and how to get data can be found under www.enmap.org

New Business Model

Public and private partnerships both in observations (such as for greenhouse gas monitoring) and in applications (such as machine learning, data access, services) are coming to fruition and are expected to make major contributions that go beyond the traditional Government provided services and commercially offered services. One example is the Carbon Plume Mapper effort within the USA.

4. Action plan for the year

The IAF Earth Observation Committee looks forward to a robust series of sessions at IAC 2022 in Paris. The number of abstracts submitted in several sessions were overwhelming. Thus, the EOC will need to again examine further restructuring to provide a better distribution of abstracts per session and look at creative ways to provide more opportunities given the growing number of submissions. EOC will continue to support its Subcommittee GEOSS, in the proposal of Satellite Earth Observation Oriented Highlight Lectures, Plenaries and Special Sessions for IAC 2023, further cooperation with Young Professionals and support IAF participation in GEO.