IAF Committee Briefs



July 2021

IAF EARTH OBSERVATIONS COMMITTEE

1. Introduction/Summary

Earth Observations has entered an era of high importance on international political and social agendas due to the twin threats of global climate change and biodiversity reduction. At the same time, dramatic advancements in technologies, business models, and science are providing the opportunity to provide accelerating value to society as threats and impact along with opportunities to provide actionable information for societal decisions all increase. The most noteworthy developments from November 2020 through May 2021 are highlighted.

2. Latest Developments

On May 25, 2021, NASA announced a new Earth System Observatory consisting of a series of missions. with the objective to provide key information for climate change, disaster mitigation, fighting forest fires and improving real-time agricultural processes. The first, already in development as a pathfinder is NISAR (NASA ISRO synthetic aperture radar) in partnership with the Indian Space Research Organization (ISRO) to measure processes such as ice-sheet collapse, and natural hazards like earthquakes. On May 20th, 2021 ESA, JAXA and NASA announced an Earth Observation Dashboard hackathon to study COVID-19's environmental effects. NASA/ESA/EUIMETSAT/NOAA launched Sentinel-6 Michael Freilich to measure global sea surface height on November 21, 2020. Its first release of calibration data was announced on December 10, 2020, and the satellite was moved into an orbit trailing Jason 3 to perform cross calibration for 6-12 months. The first publicly available data is expected in early summer 2021. On December 17, 2020, ESA announced the appointment of Josef Aschbacher as the next Director General. He was ESA Director of Earth Observation Programs, and head of ESA's Center for earth Observation ESRIN. He has been a major supporter and participant in EO events at IACs. 2020 Marked NOAA's 50th anniversary and the 60th anniversary of TIROS 1, the worlds first weather satellite. In May 2021, NOAA began operationally ingesting commercially purchased Radio Occultation data. Initial commercial contracts were awarded to commercial firms GeoOptics and Spire, in Nov 2021. Also in May 2021, EUMETSAT and NOAA co-sponsored the second International Operational Satellite Oceanography Symposium to help advance the use of satellite oceanography for operational use across a wide variety of government and industry users. EUMETSAT welcomed a new Director General, Phil Evans who had previous experience at the UK Met Office. KARI launched the Next Generation Mid-size Satellite 1 on 2 April 2021 to provide precision ground observation with data flow to users anticipated to start in October 2021. China Aerospace Science and Technology Corp Gaofen-12 high-resolution Earth Observation System Satellite was successfully launched on 30 March 2021. This satellite will be used in land surveys, urban planning road network design, crop yield estimation and disaster relief. Brazil's Amazonia -1 Earth observation satellite was launched on the Indian PSLV on 28 February 2021. This INPE satellite addresses monitoring deforestation in the Amazonian region and analysis of diversified agriculture. It is the first EO satellite completely designed, integrated, tested and operated by Brazil. ISRO launched the EOS-1 SAR satellite to provide data for applications in forestry,



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agriculture and disaster management. On 15 April 2021, a consortium led by the State of California, NASA JPL, and Planet announced plans for a constellation of hyperspectral satellites to pinpoint, track and quantify sources of methane and carbon dioxide as an element of the public-private partnership Carbon Mapper. The first two satellites are scheduled to launch in 2023. Partners also include U of Arizona, Arizona State, the High Tide Foundation and the non-profit RMI. In November 2020, ESA announced the award of contracts for three pairs of satellites for the Copernicus program. They include Copernicus Imaging Microwave Radiometer (CIMR), Copernicus Hyperspectral Imaging Mission for the Environment (CHIME), and the Copernicus Land Surface *Temperature Monitoring (LSTM) mission. Capella Space* started commercial operations in January 2021 and is selling SAR data.

Organizational News from Committee Members - TNO delivered an important instrument for Sentinel 5. CAST is working on space solar power. NOAA indicated that the new administration has climate as a top priority. CNES is having a great year with hardware in process moved from US to France, progress on microcars and a big spectrometer presentation in Dubai. DLR HQ is being reorganized. JPL indicated exciting times with the launch of Sentinel 6 - Michael Freilich, work on SWOT with CNES and work on NISER with ISRO. ESA indicated that Copernicus/Sentinels SRRs are proceeding and going well and ESTEC is working on-site from time to time. Airbus Munich will deliver 30 cm resolution capability to market in April, SEOSAT did not make it to orbit, work continues on radar, optical and thermal IR push broom instruments. Japan worked hard on formalizing a 224.48 Yen budget in the Diet for JAXA which represents a 13.6% increase including exploration, more on EO; H3 will have its first launch and ALOS3 will be launched - a very busy year during the pandemic. India quieter for the past year due to COVID impacts, but a new agriculture information system for farmers newly introduced has reached 300,000 so far and has a goal of 1M in the coming year. SODERN just won a narrow aperture camera contract and delivered a navigation camera for JUICE. OHB won a CO2 monitor contract for CHIME and signed a contract for an arctic mission with EUMETSAT. Thales Alenia Space (JV between Thales (67%) and Leonardo (33%) signed as prime contractor for 3 missions of Copernicus expansion (CIMR, CHIME and ROSEL and Italian COSMO SkyMed Constellation follow on. It will also supply the IRIS radar altimeter for the CRISTAL mission and the payload for the CO2M mission. With NorthStar, Thales Alenia Space has built the first three satellites of the skylark constellation for space surveillance and monitoring of space debris.

3. Breakthroughs

The major breakthrough in Earth observations is that commercial earth observations are moving beyond visual imagery with a number of added spectral channels for imagery, fully commercial SAR, transportation services such as tracking ocean going traffic, and radio occultation for weather and climate. In addition, the imagery coverage of earth has been greatly expanding providing new insights into both human and natural phenomena on earth, and shaping news, information and understanding with new insights derived from the level of coverage that now exists. A second breakthrough is the growing cooperation between space agencies to conduct space-based Earth observations. Understanding the complex Earth system is extremely difficult and requires challenging measurements made over long time series. Through international cooperation, these measurements are being made. The Third breakthrough this year is the movement to conduct space-based missions on smaller commercially available satellites. As buses become more of a commodity, the cost of the overall missions is decreasing.

4. Action plan for the year

The committee plans to make adjustments to a couple of its sessions to respond to the great interest and many advances coming in-ground systems, machine learning, and data analytics applications to transforming satellite data feeds into actionable information for the wide range of users needing earth observations data from Governments, to commercial concerns to private citizens.