UN-COSPAR Symposium

Space-Observation Contributions Supporting Climate Action

Sponsored by the United Nations Office for Outer Space Affairs (UNOOSA) during STSC 60 and as part of the UN Agenda for Sustainable Development

Tuesday, 14 February 2023, 15.00 – 17.00 CET

Vienna, Austria

Time	Speaker	Title	Abstract
15.00 – 15.05	Pascale Ehrenfreund COSPAR President	Introduction by the COSPAR President	N/A
15.05 – 15.15	Ralph Kahn Chair COSPAR Scientific Commission A; NASA Goddard Space Flight Center	Introduction to the Symposium	N/A
15.15 – 15.30	Kate Calvin NASA Chief Scientist and Senior Climate Advisor	How NASA Missions and Research Inform Climate Decisions	NASA conducts climate research and provides data critical for governments, private companies, and others across the globe. NASA's climate-related research encompasses greenhouse gas levels, sea level rise, solar activity, global surface temperatures, ozone layer conditions, air pollution, and changes in sea ice and land ice. Dr. Kate Calvin will discuss the current state of climate research at NASA, the agency's strategic science objectives and how she's working to implement coordination within and outside of the science community at NASA.
15.30 – 15.45	Edward Blanchard-Wrigglesworth University of Washington Seattle	The Influence of Multi-decadal Sea-ice Loss on Climate Forecasting	Sea ice is a key component of Earth's climate, influencing climate in the polar regions and afar via its impact on surface albedo, surface heat fluxes and freshwater transport. Continuous satellite observations have been crucial to monitor sea ice changes since the 1970s, which have shown a drastic decline of Arctic sea ice. Future rates of sea ice loss are dependent on future climate change, but will also influence future climate change.
15.45 – 16.00	Anny Cazenave Laboratoire d'Etudes en Géophysique et	How Satellite Measurements of Sea-level Rise Contribute to	For three decades already, satellites routinely measure the global mean sea level rise and its regional variability. Satellites and other in situ observations also allow quantifying the climate-related contributions to the observed rate of rise. They show that accelerated land ice melt from Greenland and Antarctica explain most of the accelerated increase in sea level. Since recently, satellites also allow measuring sea level changes along the world coastlines. Measuring present-

	Océanographie Spatiales (LEGOS)	Coastal Impact Assessments	day sea level rise from global to local scales and understanding its causes is a major goal for improving future projections and assessing its impacts on coastal societies.
16.00 – 16.15	Angelica Tarpanelli Italian National Research Council	Earth Observation monitoring of African rivers in a climate change context to inform water management	Water availability is essential to ensure life, especially in developing countries such as those in Africa. Here the priority is to monitor water availability to manage water resources, assess the risk of floods and droughts with the goal of not only mitigating extreme events but also achieving sustainable and equitable development. The hydro-monitoring of those scarce data areas is often absent or incomplete and the satellite Earth Observation represents a rich source of data. An overview of the possible way to analyze the satellite observations into hydrological/hydraulic modelling will be presented with particular emphasis on the estimation of river discharge in a climate change context, using radar altimetry and optical sensors.
16.15 – 16.30	C.K. Shum Ohio State University	Satellite Geodesy as the Sentinel for Climate-induced Hazards Monitoring	The advent of the Space Age initiated the use of Earth-orbiting satellites for innovative studies of Planet Earth. An exponentially increasing number of scientific and commercial Earth orbiting satellites are delivering global and timely sensing of the Earth from space, on its surface or inside the Earth. The onset of climate change and its dire consequences has been exacerbating the adverse impacts on Earth and its inhabitants. Timely satellite-based Earth observations at adequate spatiotemporal sampling provide a means to monitor the evolutions of more frequent and abrupt climate-induced/-enhanced hazards. These observations could contribute towards the elucidation of their respective governing climatic processes, and enable improved hazard forecasting and informed hazard management and response. Example satellite geodetic and other observations include satellite gravimetry, altimetry, GNSS bistatic altimetry, SAR/InSAR, and Planet Inc's high spatiotemporal resolution multispectral images. Here we present example studies using deep-machine learning analytics downscaled satellite observables, for monitoring of abrupt weather episodes, including floods, groundwater depletions, cyclone landfall, snow-storms, and meteotsunamis.
16.30 – 16.45	Nancy H.F. French Michigan Technological University	Spacecraft Monitoring of Regional Wildland Fire, Smoke Transport, and Applications to Fire Management and Air Quality	Climate-driven changes to wildland fire and smoke are expected to increase in warmer and dryer conditions predicted for many fire-prone regions. We will review the use of satellite sensing technologies for mapping and monitoring wildland fire and smoke and the value of these methods for fire and smoke management as well as characterizing air quality, relevant to human health.
16.45 – 17.00	Aneesh Subramanian University of Colorado Boulder	Butterfly: A Satellite Mission to Transform our Understanding of the Contribution of Air-Sea Fluxes to Weather and Climate	The ocean, the largest reservoir of heat and water on Earth, exchanges heat and moisture with the atmosphere through turbulent fluxes at the air–sea interface. These fluxes impact atmospheric and oceanic variability, thereby modifying weather and climate, including precipitation patterns, terrestrial water availability, floods and droughts, and extreme events such as terrestrial and marine heatwaves. Some of the largest fluxes occur over Western Boundary Currents (WBCs) when dry, cold continental air is carried over these large warm currents by midlatitude westerlies. The high wind speeds and large air–sea temperature and humidity differences result in large sensible and latent heat fluxes which affect lower atmosphere temperature and humidity. However, not only are the magnitudes of these fluxes important, but their spatial gradients matter as well. This is true even in regions outside the

			WBCs: small-scale (~25 km) sea surface temperature variations associated with ocean fronts and eddies are ubiquitous in the world ocean. Recent evidence indicates that large-scale atmospheric circulation depends on air–sea interaction processes that are directly mediated by small-scale fluxes. In this presentation we will discuss Butterfly, a proposed NASA Earth Venture Mission. Butterfly's 2-year, single satellite mission is designed to deliver estimates of global air–sea turbulent heat and moisture fluxes at the <25-km spatial resolution and <15% net uncertainty. Accurate global 25-km flux measurements are needed to improve our knowledge of air–sea interaction processes and how they impact weather and climate model prediction. Butterfly is the first satellite mission to focus specifically on air–sea fluxes. It carries a single passive microwave instrument and will be placed in a high inclination orbit with a swath width of 640 km with 91% global coverage achieved in 2 days. Butterfly science questions include understanding the degree to which these fields of high-resolution turbulent heat and moisture fluxes influence midlatitude storm evolution. In addition, the error characteristics of Butterfly measurements will enable developers of satellite-based global ocean turbulent heat and moisture flux products to balance these contributions to the energy and water cycles to within 5%. The satellite characteristics will be discussed, and mechanisms for community engagement with Butterfly data and science will be highlighted.