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Oral
Airborne radio occultation (ARO) has become an integral component of the Atmospheric Rivers Reconnaissance Program (AR Recon) led by the Center for Western Weather and Water Extremes at Scripps Institution of Oceanography. AR Recon seeks to support water management decisions and flood forecasting in the western US by testing the potential of targeted airborne and buoy observations to improve forecasts of the landfall and impacts of atmospheric rivers (ARs). AR Recon was active in 2016, 2018, 2019, 2020 and 2021, releasing dropsondes into ARs and their surrounding environment for assimilation into operational as well as research runs of numerical weather prediction (NWP) models. ARO has been deployed on the aircraft used in 4 of the 5 years to augment the coverage of dropsondes in the targeted regions, by providing refractivity profiles to the sides of the aircraft that can penetrate thick clouds an precipitation. Some of the accomplishments include retrieval of the first Galileo RO profiles, quantification of the accuracy in extremely variable temperature and moisture conditions, and contributions to several case studies on the relative impact of RO observations. The standard ARO system on the National Oceanic and Atmospheric Administration GIV aircraft has a phase tracking receiver and avionics antennas. With this system 70% of the occultations sampled lower than 4 km altitude. For the 2021 season, we made several advances including upgrading to a multi-GNSS antenna to record all GPS, Galileo and Glonass rising and setting occultations to ~record 8 occultations per hour of flight. We deployed a GNSS-inertial navigation system with a real-time precise point positioning correction service to examine the impacts of the derived real-time velocity errors on the profile quality, with the perspective of implementing real-time processing on board for operational use. We deployed a GNSS signal recorder to record raw Radio Frequency (RF) data for postprocessing optimization of open loop tracking in the lowest troposphere within the AR core. We also recorded raw RF data from a side-mounted H/V linear polarized antenna to evaluate the possibility of retrieving data on hydrometeors, including observations from heavy tropical precipitation near Hawaii. As of Feb 1, we had recorded 543 radio occultation profiles over the first 7 missions. This included one 6-day sequence of consecutive flights leading up to the devastating event in Santa Cruz, CA, where wildfire related mudslides and a road collapse occurred. The data set will be analyzed and made available for data assimilation experiments for this high impact case as well as to facilitate development of improved observation operators for assimilation of ARO into NWP models.
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