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DECLIC EVO: FINAL TOUCHES BEFORE REFLIGHT

Abstract

DECLIC is a multi-user facility to characterize critical uids behavior and directional solidication growth structures of transparent alloys. As part of a joint NASA/CNES microgravity science program, DECLIC has been operated onboard the ISS since October 2009. Housed inside a NASA science rack, DECLIC operates three experiment inserts in turn for periods of 3/6 months: HTI (studying critical water), ALI (studying critical SF6) and DSI (Directional Solidication). Experiments are monitored and controlled from CNES in Toulouse, France. The initial scientic program has been completed, and the reight program is almost complete. Unfortunately, a laser failure in November 2017 led to return DECLIC facility to the ground on SpaceX-16 on Jan.14th 2019 to have it repaired and upgraded into DECLICEVO. That upgraded facility -which should re-y late 2021- combined with promising scientic results is paving the way to new perspectives and horizons. It will allow the completion of the full DECLIC scientic program, as well as new scientic objectives hosted in two newly developed inserts to cover at least until 2024. On the engineering side, the challenge of refurbishing a 10-year old payload was to nd solutions with respect to obsolete components, without aecting the overall system architecture. For instance, the laser that failed is not manufactured anymore, and it has been a challenge to nd another laser with the exact same optical properties that would physically t exactly in lieu of the previous one and matching its optical path. On the scientic side, NASA and CNES agreed on 2 new inserts that are now being developed by CNES: - AEROSOL insert, that will help understanding the phenomena taking place within clouds, which is essential for a better climate understanding. The main objective is to implement the necessary components to achieve drops formation, stabilization and turbulence injection. - SCWO (Super Critical Water Oxidation) insert, whose objective is to pursue studies led on supercritical water with HTI/HTI-R inserts, targeting the development of oxidation processes in supercritical water. The applications could be the treatment of organic waste, which is in phase with NASA's Exploration vision. This extended NASA-CNES mission could focus on waste disposal for future long-duration crewed spaceights, using 'supercritical' water to disassemble organic molecules. This paper aims at presenting the current status on DECLIC repair, upgrade and qualication (ight segment as well as ground segment), a recap of the 10-year-long science and operations, and an overview of the new scientic program.