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# MICROWAT, a low-frequency microwave mission for an all-weather and high spatial resolution observation of the oceans and sea ice

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Surface characterization from satellites is required to understand, monitor and predict the general circulation of the ocean and atmosphere, the interaction between the surface and the atmosphere, as well as the water and energy cycles. With more than 70% cloud coverage at any time, visible and infrared satellite observations only provide limited information. Regardless of the cloud cover, passive microwaves offer ocean and sea ice information such as Sea Surface Temperature (SST), Ocean Wind Speed (OWS) even under extreme conditions, Sea Surface Salinity (SSS), Sea Ice Concentration (SIC) or thin Sea Ice Thickness (SIT). These products are particularly important for polar regions that are very vulnerable to climate change. Up to now, all these oceanic/sea ice parameters estimated from passive microwave observations are limited in spatial resolution and/or accuracy.

We propose an innovative low-frequency passive microwave conically scanning imager, MICROWAT, in a polar orbit. It will observe at 1.4, 6.9 and 10.65 GHz (L, C, and X bands) with low-noise fully polarized receivers, and a foldable mesh antenna of 5 to 7 m-diameter. The 18GHz channel could be added, if judged necessary. Sensitivity analysis will be conducted.

MICROWAT will provide global SST estimates regardless of cloud cover, twice daily, with an accuracy of 0.3 K and a spatial resolution from 15 to 10 km, depending on the antenna diameter. The SIC will have an accuracy of 5%, with the same spatial resolution. Accurate measurements will be provided up to 20 to 15 km to the coast and transition zones (depending on antenna size). MICROWAT will estimate SSS with an instantaneous accuracy of better than 0.5 psu, and SIT for thin ice, both at 59 to 43 km horizontal resolution. It will also provide OWS even under extreme conditions, thanks to the combination of L, C, and X band measurements.

With no guarantee of continuation of low frequency microwaves (after AMSR2, SMOS and SMAP), MICROWAT shall provide continuity, with contemporaneous measurements in the three bands and much improved spatial and/or radiometric characteristics. This will insure higher accuracy of retrieved products as well as their improved consistency. It will complement the MetOp-SG passive microwave observations that cover the 18 to 664 GHz range. It could fly in tandem with this mission to benefit from the synergy with the microwave imagers and sounder as well as with the scatterometer on board this platform.

With its unprecedented all-weather accurate and simultaneous estimation of multiple ocean, and ice parameters, MICROWAT will provide the oceanic forecasting systems with products compatible with their increasing spatial resolution and complexity, with impact for societal applications. It will also answer fundamental science questions related to the ocean and its interactions with the atmosphere.