Research plan of the MICA project

Jean-Philippe Duvel[1], Keunok Lee[2], and Hugo Bellenger[1]

[1]*Laboratoire de Météorologie Dynamique, Ecole Normale Supérieure, Paris, France*

[2]*Laboratoire l'Atmosphère et des Cyclones (LACy), CNRS, Météo-France, Université de La Réunion, Saint Denis, France*

ABSTRACT

Tropical cyclones are among the most devastating meteorological phenomena on Earth. They are associated with heavy precipitation, wind gusts, storm surges, flooding, and landslides as well as oceanic waves. Their enormous energy, fueled by the moist air above warm ocean, causes fatalities, loss of crops and livestock, damage to infrastructure, as well as disruption of transport and communication. Current models however still suffer from serious deficiencies to predict the lifecycle of tropical cyclone, especially the intensification phase. The major difficulty to model cyclone intensification is the multiplicity of causes from synoptic scale, mesoscale, convective scale and microscale. No single process acting on cyclone intensification is considered dominant. Among them, the local processes occurring at the air-sea interface is a key ingredient that has been identified as one of the largest source of uncertainties in our understanding of cyclone intensification, it's mainly due to a lack of relevant measurement data.

With the aim to acquire real-time and continuous direct measurement of cyclone intensity using an innovative balloon-based device, Aeroclipper, and to scrutinize the dynamics and thermodynamics of tropical cyclone in the marine-atmospheric boundary layer, the MICA (Mesure de l'Intensité des Cyclones par des Aéroclippers) project was initiated and funded by the French ANR (Agence Nationale de la Recherche) during 2019–2022. The Aeroclipper is a new balloon device consisting of a balloon (superpressure), one gondola with atmospheric and oceanic sensors (i.e. wind, temperature, humidity, SST, and GPS), and a guide-rope (about 40 m) and designed to perform relatively long flights (of up to 30 days) in the surface layer (under 50 m) over remote ocean regions. The detailed information of Aeroclipper and the plan for test field campaign in 2022 in Guam Island will be presented in the conference.