EUREC^{4}A – ATOMIC program is a EU-US research endeavor funded by European Research Council and National Oceanographic and Atmospheric Administration, and endorsed by World Climate Research Program. Its overreaching goal is to fill the gaps in our knowledge about the role of marine convective clouds in climate system. Uncertainties related to possible behavior of clouds in future climate is a major limitations in climate projections. Thus, with this project we plan to reduce these uncertainties and make weather and climate models more robust.

With VHIRES TUREX we propose to form a Polish team, which will join the international EUREC^{4}A–ATOMIC community as a partner and participant that contributes synergetic measurements to improve our knowledge about ocean-atmosphere interactions, in particular heat fluxes, which drive formation and organization of marine convective clouds. To do this properly we need detailed information on transport processes (turbulence) on both sides of atmosphere-ocean interface. While moderate and low spatial resolution measurements are well covered by many groups participating in this program, the high-frequency and high-spatial resolution measurements are underrepresented or sometimes absent. We propose to close this gap by performing synergistic high-resolution measurements in coordination with other teams involved. As a result we will produce an open, publicly available dataset of high-frequency and high-spatial resolution measurements in the atmosphere and the ocean.

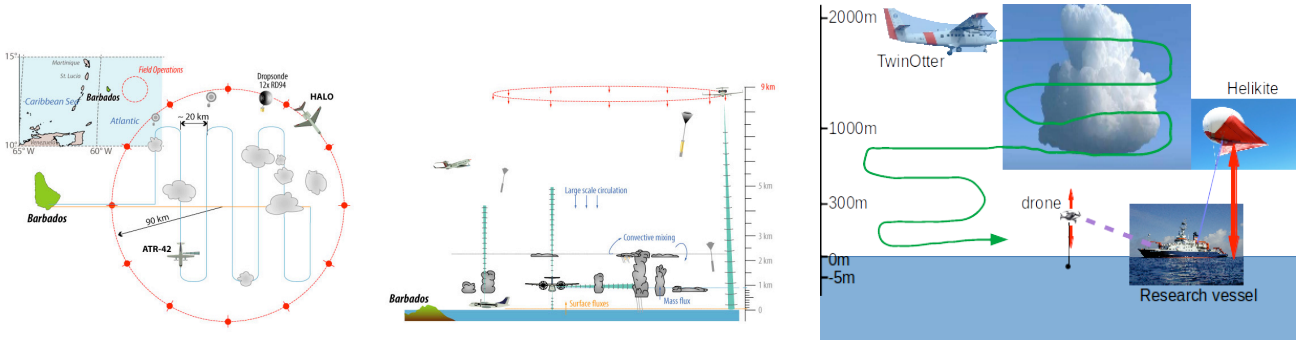

Figure. Left: overall scheme of EUREC4A measurement campaign. Right: measurements planned within VHIRES TUREX project.

In particular we plan to deploy Ultra Fast Thermometers developed at the Institute of Geophysics, University of Warsaw on American Twin Otter research aircraft operated from Barbados and German Cloudkite (Helikite) tethered balloon operated from a research vessel. UFT's will measure temperature fluctuations with a centimeter resolution, which will help to understand cloud creation, evolution and dissipation.

We also plan to use a small remotely piloted quadcopter drone, launched from the research vessel with instruments measuring properties of the air close to the sea surface and the sea surface temperature as well as temperature profiles down 5 m below ocean surface. The last measurement will be possible due to a small thermometer at the end of the rope tethered to the quadcopter.

Using a small optical particle counter we will also measure (using drone and Cloudkite) aerosols – cloud condensation nuclei necessary for clouds formation.

All the measurements will be coordinated with efforts of more than 30 scientific groups contributing to EUREC4A/ATOMIC.