EUREC^{4}A-MIP : Model Representation of Shallow Mesoscale Organized Convection

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Shallow Cumulus over the subtropical oceans is the most abundant cloud type in our climate system and its radiative response to global warming is highly uncertain. Previous MIPs on shallow cumulus convection have explored the representation of spatially unorganised shallow cumulus convection and their response to climate warming.

It has become clear over the last decade that marine shallow cumulus convection has a natural strong tendency to develop into mesoscale organised cloud structures and that unorganised shallow cumulus convection is rather the exception than the rule.

It is particular challenging to realistically simulate these mesoscale cloud patterns. On the one hand, this requires turbulence resolving resolutions to represent the vertical convective mixing processes while at the same time domains of several hundreds of kilometres are needed to represent the observed mesoscale cloud structures. It is only recently that the computational capability is allowing us to simulate these rich structures.

It is for this reason that we propose a MIP on shallow cumulus convection over the Northern Atlantic subtropical ocean such as observed during the EUREC^{4}A field campaign in January-February 2020.

The main objectives of this MIP are:

- How well can models reproduce the broad range of observed mesoscale shallow cloud patterns over the sub-tropical oceans?
- How are these mesoscale organised shallow cloud patterns responding to pseudo-global warming perturbations?
- What are the physical processes underlying the mesoscale organisation of shallow convection and its changes?

Ideally this requires models that simulate the atmosphere at turbulent resolving resolutions of 100 meter on domains of several thousands of kilometres. At present this is not yet a numerically feasible configuration. We therefore propose to have two different model approaches in this MIP that concentrate on different spatiotemporal domains and resolution:

- Storm Resolving Model (SRM) simulations with resolutions of 1~4 km over a domain of typical 2000 x 2000 km^2 for the whole EUREC4A period of Jan-Feb 2022.
- Large Eddy Model (LEM) simulations with resolutions of 100~400 meter over a domain of 150 x 300 km for the period Feb 1-11 2020.

Everyone is welcome to attend this discussion. Your feedback and participation will be highly appreciated.