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Improvement of LES boundary layer cloud parameterisations to study the entrainment mixing process

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This presentation focuses on improvement of warm bulk microphysical scheme for LES boundary layer cloud simulations to represent and study entrainment mixing process.
Different developments have been performed in order to better represent the cloud fraction, the clear and cloudy air mixing and the aerosol activation.
Three aspects are refined:
The subgrid cloud fraction: a new approach adapted to the LES simulations, which offers an alternative to the classical approach based on PDF, have been elaborated. This approach represents the cloud fraction without subgrid statistical distribution hypothesis of the thermodynamical variables.
The subgrid mixing of the clear and cloudy air: we take into account the mesh homogeneous time to compute the cloud fraction after mixing and the mixing nature (homogeneous or heterogeneous) which impacts the cloud microphysical parameters.
The saturation inside the cloud: A new cloudy saturation estimation is used to better represent the spatial variability of the activated particles.
These different new parameterisations will be described. Their improvements and impacts will be discussed based on various simulations.