C[3]IEL, THE CLUSTER FOR CLOUD EVOLUTION CLIMATE AND LIGHTNING MISSION TO STUDY CONVECTIVE CLOUDS AT HIGH SPATIAL AND TEMPORAL RESOLUTIONS

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Clouds and water vapor are key elements of the Earth climate system. However, uncertainties remain about their interactions and their evolution in the context of climate change. Indeed, better knowledge of their exchanges and interactions at high spatial and temporal resolutions is needed to improve their representation in small-scale models such as LES (Large Eddy Simulation) models, and to eventually progress in numerical weather and climatic predictions.

The French-Israeli space-borne C[3]IEL (Cluster for Cloud evolution, ClImate and Lightning) mission is an innovative way, currently under study, to provide new insights on convective clouds, at high spatial and temporal resolutions, close to the scales of the individual convective eddies. The mission aims simultaneously at characterizing dynamically the convective clouds, their interactions with the surrounding water vapor, and their lightning activity.

The C[3]IEL mission consists in a short-baseline (~150 km) train of 2 coordinated nano-satellites. Each nano-satellite carries a visible camera (670 nm) for cloud imagery at a spatial resolution of ~20 meters, near-infrared water vapor imagers (1.04, 1.13 et 1.37 µm) measuring in and near the water vapor absorption bands, a lightning imager (777.4 nm) and a photometer (777.4 nm). During daytime the cloud and water vapor imagers will observe the same scene through a succession of images sampled every 20 seconds during the overpass of the nanosat train, while the lightning activity will be measured continuously. In particular, the C[3]IEL observations will document:

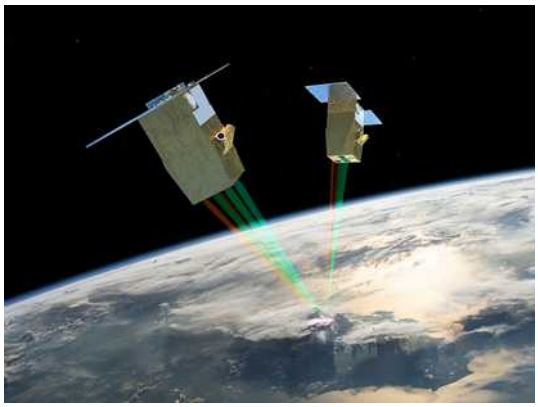

Illustration des satellites de la mission C3IEL
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- the cloud tops and 3D cloud envelop structures at a decametric resolution and their temporal evolution during the overpass time,
- the spatial organization of convective clouds with horizontal extent of few hundreds of meters,
- the water vapor content around clouds,
- the electrical activity induced by the convective processes that create clouds and its relationship with the water vapor in the upper troposphere.

First, the scientific objectives of the C[3]IEL mission will be reminded. Then, we will introduce the nano-satellite train configuration, the different sensors of the mission and the innovative observational strategy that will be applied. Finally, we will detail the expected observations, the excepted products and the current status of the C[3]IEL mission.