

International Master 2 Atmospheric Environment: Research Training 2018-2019

Laboratory: LOA

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CaPPA Work Package: WP-5 Cloud-aerosol interactions

Cloud properties susceptibility to marine aerosols AOD: do clouds exhibit a critical phase transition?

Cloud condensation nuclei CCN and environmental conditions (humidity, temperature, etc.) play a major role in cloud formation and in determining different macroscopic cloud characteristics, like height, cloud liquid water content, and cloud base altitude. A way to quantify this is to determine a kind of susceptibility which represents the change of the cloud characteristic when CCN concentration changes under given thermodynamical conditions.

In this Master 2 internship, the student will investigate how thermodynamics impact such a susceptibility, i.e. environmental conditions. Focus will be put on marine conditions, especially in the Indian Ocean where the environment is far from anthropogenic impacts and is thus close to pre-industrial conditions. If time allows, other similar oceanic region will be considered for comparison. The student will analyze data from ERA-Interim reanalysis and will determine if cloud macroscopic properties are governed by scaling laws with exponents to be calculated. The underlying question is to know whether clouds at the mesoscale exhibit a critical (or high order) phase transition like the paramagnetic/ferromagnetic transitions or the gas/liquid transition in precise condition.

Skills : Python language, Understanding of statistical and theoretical physics

Key words: Cloud properties, susceptibility, phase transition, scaling laws, critical exponents, statistical physics