

Impact of turbulence on cloud microphysics of water droplets population

Original

Impact of turbulence on cloud microphysics of water droplets population / Golshan, Mina; Tomatis, Mattia; Abdunabiev, Shahbozbek; Fraternali, Federico; Vanni, Marco; Tordella, Daniela. - ELETTRONICO. - (2020). ((Intervento presentato al convegno EGU General Assembly 2020 tenutosi a Vienna, Austria nel 4 - 8 May 2020 [10.5194/egusphere-egu2020-22539]).

Availability:

This version is available at: 11583/2808312 since: 2020-04-02T15:41:23Z

Publisher:

EGU European Geosciences Union

Published

DOI:10.5194/egusphere-egu2020-22539

Terms of use:

openAccess

This article is made available under terms and conditions as specified in the corresponding bibliographic description in the repository

Publisher copyright

(Article begins on next page)

EGU2020-22539

<https://doi.org/10.5194/egusphere-egu2020-22539>

EGU General Assembly 2020

© Author(s) 2020. This work is distributed under the Creative Commons Attribution 4.0 License.



Impact of turbulence on cloud microphysics of water droplets population

Mina Golshan¹, Mattia Tomatis¹, Shahbozbek Abdunabiev¹, Federico Fraternali², Marco Vanni¹, and Daniela Tordella¹

¹Dipartimento di Scienza Applicata e Tecnologia, Politecnico di Torino, 10129 Torino, Italy

²Center for Space Plasma and Aeronomic Research, University of Alabama in Huntsville, Huntsville 35899 (AL), USA

This work focuses on the turbulent shearless mixing structure of a cloud/clear air interface with physical parameters typical of cumulus warm clouds. We investigate the effect of turbulence on the droplet size distribution, in particular, we focus on the distribution's broadening and on the collision kernel. We performed numerical experiments via Direct Numerical Simulations (DNS) of turbulent interfaces subject to density stratification and vapor density fluctuation. Specifically, an initial supersaturation around 2 % and a dissipation rate of turbulent kinetic energy of $100 \text{ cm}^2/\text{s}^3$ are set in the DNSs. Taylor's Reynolds number is between 150 and 300. The total number of particles is around 5-10 millions, matching an initial liquid water content of 0.8 g/m^3 . Through these experiments, we provide a measure of the collision kernel and compare it with literature models [Saffman & Turner, 1955], which is then included in a drops Population Balance Equation model (PBE). The PBE includes both processes of drops growth by condensation/evaporation and aggregation.