Geophysical Research Abstracts
Vol. 19, EGU2017-888-1, 2017
EGU General Assembly 2017

Integrating surface, entrainment and mesoscale in the Atmospheric Boundary Layer dynamics: a 10-year study in Cabauw (The Netherlands)

Jon Ander Arrillaga (1), Fred Bosveld (2), Pedro A. Jiménez (3), Henk K. Baltink (2), Carlos Yagüe (1), Arjan Hensen (4), Danielle van Dinther (4), Arnoud Frumau (4), Jimy Dudhia (3), Wanjun Zhao (5), and Jordi Vilà-Guerau de Arellano (6)

(1) Universidad Complutense de Madrid, Facultad de Físicas, Dept. de Geofísica y Meteorología, Madrid, Spain (jonanarr@ucm.es), (2) KNMI, De Bilt, The Netherlands, (3) National Center for Atmospheric Research, Boulder, CO, USA, (4) Energy Research Centre of the Netherlands, Petten, The Netherlands, (5) Beijing Guokr Interactive Technology Media Co. Ltd, Beijing, China, (6) Meteorology and Air Quality Group, Wageningen University, Wageningen, The Netherlands

The diurnal evolution of the Atmospheric Boundary Layer (ABL) in Cabauw (Netherlands) is investigated by considering the role of local and non-local forcings. By local, we understand, the surface fluxes that drive the growing of the ABL in addition to the non-local entrained fluxes. We study potential disruptions occurring in spring and particularly in summer driven by the formation of sea-breeze flows in the form of density currents, due to the proximity of both The North Sea and the Ijsselmeer closed sea. Moreover, this interactive system of surface, boundary layer and mesoscale may play a role in the transport of carbon dioxide and its diurnal variability.
Our method is based on the analysis of a comprehensive 10-yr observational database (2001-2010), which gives the opportunity to understand the ABL dynamics from a robust perspective. To support the analysis, modelling results obtained from the WRF mesoscale model are available during the entire 10-year period. The model is run every 48 h to maintain it close to the synoptic conditions calculated by the ERA-Interim state. A fine horizontal resolution of 2 km is used, and the vertical levels are set to match the observational ones (2, 10, 20, 40, 80, 140 and 200 m).
In order to identify the sea-breeze arrival, we apply a sea-breeze criteria selection algorithm. It is developed and adapted after a sea-breeze observational study in the Cantabrian Coast (Spain) to filter the sea-breeze events occurring in Cabauw, and consequently analyse their impact in the ABL and the surface fluxes. Preliminary results show that this criteria is able to distinguish between the two main wind directions related to the sea breeze in Cabauw. Our finding shows that the sea-breeze days are characterized by a sharp increment of the wind speed and a noticeable increase of the specific humidity at around 16-17 UTC.