

MAX-PLANCK-GESELLSCHAFT

Impact of mixing height estimation on heterogeneous terrains with different algorithms and instruments on atmospheric transport models.

Abstract

A synergy of data sources and methodologies to retrieve Mixing Height [MH] is studied in order to infer an optimal estimate of the MH over Europe and in particular over Germany. Satellite data as CALIPSO and ground bases ceilometers are used to estimate MH candidates. A comparison with fields of MHs estimated using Richardson Bulk number method from radiosondes data and geostatistically interpolated over the domain is performed to see if there is a match. Methodologies for retrieving MH from lidar signals and layer attribution method will be shown as well, as part of a preliminary study in order to constrain Lagrangian transport models with the aim of estimating source and sinks of green house gasses.

Krigging with External Drift KED

After Krige [1] geostatistical interpolation has become a useful tool for in-terpolating fields of meteorological quantities over a time-space grid [2]. It was successfully applied in numerical experiments to reduce uncertainties on CO₂ mixing ratios estimates [3]. KED provide a more robust approach to recreate realistic trend Fig. 5 than a linear interpolation. Actual limit is the availability of data, few WMO radiosondes mostly at 12 and 00 UTC. We hope that introducing other data sources of MH results in Green House Gasses [GHG] estimates will improve as can be seen in the numerical experiment proposed by [3].



Fig. 1 From [3]. Mean diurnal evolution of the CO2 mixing ratios separated for the individual flux components Gross Ecosystem Exchange (GEE) a), respiration b) and fossil fuel c) shown for the receptor heights 5 and 30 m (agl) at the tall tower facility Bialystok, Poland for August, 2006 and each of the cases of the pseudo data experiment.

Edges/MH from lidar Fig. 2 Detection of MH from lidar like instrument, algorithm flow. Wavelet Steyn Selection of best Jordanestimate (variance) Canny Fig. 3 Algorithms used to detect edges or MH, Jordan, maximum in variance, [8]; Steyn, fit with Erf function [5]; Wavelet (Haar) [4]; Canny 2D edge detection [7].









Fig. 4 CHM15k ceilometer network of the German Meteorological Service with preprocessed profiles, a surface representing a subset of a CALIPSO orbit with a possible estimate of MH as a black line. Over the topography is represented the interpolated radiosondes values using the KED method.

References

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Fig. 6 29 September 2009 14:30, Visible image of Europe.

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