

## The effect of the inclusion of online aerosol-cloud feedbacks on solar radiation feedback

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The intricate feedbacks between aerosol and clouds are currently regarded as the single major uncertainty in future climate projections and are believed to have a significant role also on weather prediction. Aerosol-clouds interactions are explicitly simulated only in three-dimensional models that solve both meteorological and chemical processes at the same time (online models). One such model is WRF/Chem. Recent developments, carried out in collaboration with NOAA, include the implementation of cloud feedbacks with the up-to-date module for the organic fraction, based on the Volatility Basis Set (VBS) approach. We test the skills of this state-of-science model for short term (few days ahead) forecast of solar radiation at the European scale. Results are evaluated against ground based observations of the downward shortwave radiation from the Baseline Surface Radiation Network (BSRN), cloud cover information from the International Satellite Cloud Climatology Project (ISCCP), and satellite data. We highlight the importance of including the representation of interactions among meteorology, radiation and chemistry for a better solar energy forecast.

## Atmospheric methane concentration at the ClimaDat network sites

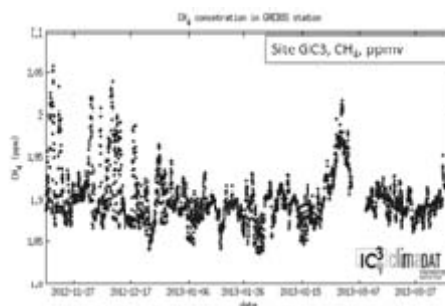
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Atmospheric concentrations of methane were obtained in continuous analyses by a Cavity Ring-Down Spectrometer (CRDS) [1] at six sites belonging to the ClimaDat network in Spain. ClimaDat measures the natural variability of the atmospheric gases related to processes that integrate changes, and that are influenced by the uncoupling and the displacement associated to climate change. Temporal and spatial heterogeneity are addressed and the source of air masses is inferred by Lagrangian backtrajectory models [2]. Synoptic meteorological situations acts a modulating drive of the pattern of the variability at the different sites, as shown in Figure 1 for the GIC3 site. A comparison of 2013 NRT series is presented.



**Figure 1:** Time series of mean hourly values of CH<sub>4</sub> with a disrupted pattern of concentration cycles.

[1] Crosson (2008) *Applied Physics B* **92**, 403-408. [2] Font *et al.* (2011) *Atm. Chem. Phys.*, **11** : 1659-1670.