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Boundary layer structure and decoupling from synoptic scale flow during NAMBLEX

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Abstract. This paper presents an overview of the meteorology and planetary boundary layer structure observed during the NAMBLEX field campaign to aid interpretation of the chemical and aerosol measurements. The campaign has been separated into five periods corresponding to the prevailing synoptic condition. Comparisons between meteorological measurements (UHF wind profiler, Doppler sodar, sonic aneometers mounted on a tower at varying heights and a standard anemometer) and the ECMWF analysis at 10m and 1100 m identified days when the internal boundary layer was decoupled from the synoptic flow aloft. Generally the agreement was remarkably good apart from during period one and on a few days during period four when the diurnal swing in wind direction implies a sea/land breeze circulation near the surface. During these periods the origin of air sampled at Mace Head would not be accurately represented by back trajectories following the winds resolved in ECMWF analyses. The wind profiler observations give a detailed record of boundary layer structure including an indication of its depth, average wind speed and direction. Turbulence statistics have been used to assess the height to which the developing internal boundary layer, caused by the increased surface drag at the coast, reaches the sampling location under a wide range of marine conditions. Sampling conducted below 10 m will be impacted by emission sources at the shoreline in all wind directions and tidal conditions, whereas sampling above 15 m is unlikely to be affected in any of the wind directions and tidal heights sampled during the experiment.

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