

## The Mace Head EUCAARI intensive campaign

M. Dall'Osto<sup>1</sup>, C. O'Dowd<sup>1</sup>, D. Ceburnis<sup>1</sup>, J. Bialek<sup>1</sup>, R. Dupuy<sup>1</sup>, D. Worsnop<sup>3</sup>, R. Healy<sup>2</sup>, J. Wenger<sup>2</sup>

<sup>1</sup>Centre for Climate & Air Pollution Studies  
Environmental Change Institute, National University of Ireland, Galway, Ireland

<sup>2</sup>Department of Chemistry and Environmental Research Institute  
University College Cork, Cork, Ireland

<sup>3</sup>Aerodyne Research, Inc., Billerica, MA 08121, USA

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Located on the west coast of Ireland, the Atmospheric Research Station at Mace Head is unique in Europe, offering westerly exposure to the North Atlantic ocean (clean sector, 180 degrees through west to 300 degrees) and the opportunity to study atmospheric composition under Northern Hemispheric background conditions as well as European continental emissions when the winds favour transport from that region. The EUCAARI campaign took part between the 10<sup>th</sup> of May 2008 and the 15<sup>th</sup> of June 2008. A range of other on-line aerosol instruments was deployed to measure different physical characteristics of the ambient aerosols sampled such as size resolved particle number concentrations (5nm-10µm), Aethalometer, Nephelometer, Hygroscopicity Tandem Differential Mobility Analyzer (HTDMA), cloud condensation nuclei (CCN) and also two particle mass spectrometers (Aerosol Mass Spectrometer HR-ToF-AMS and Aerosol Time of flight Mass Spectrometer ATOFMS). During the 35 days of the intensive field study, two broad periods were clearly identified: the former heavily influenced by long range transport of pollutants from the European continent (10<sup>th</sup>-31<sup>st</sup> May), the latter characterized by a much lower aerosol loading with more marine, arctic and south east air masses (1<sup>st</sup>-15<sup>th</sup> June). Furthermore, a continuous clean marine period - with Black Carbon always lower than 50nm/m<sup>3</sup> - was identified between 3<sup>rd</sup> and 7<sup>th</sup> of June as well as a period characterized by air masses originated in the south west tropics (9<sup>th</sup>-10<sup>th</sup> June).

Moreover, several short term events were identified, including 18 coastal nucleation events, five local biomass events (19<sup>th</sup> and 26<sup>th</sup>

May, 3<sup>rd</sup>, 7<sup>th</sup> and 9<sup>th</sup> of June), four events of high nitrate-containing aerosols regionally transported (16<sup>th</sup>, 18<sup>th</sup>, 23<sup>rd</sup> and 24<sup>th</sup> of May).

The ATOFMS dataset were analysed with the powerful ART-2a tool, an artificial intelligence algorithm that sorts single particle mass spectra into specific particle type or clusters. About 30 different particle types were identified by the ATOFMS, including for example sea salt, dust, Elemental carbon, biomass, Nitrate-rich and many others. Moreover, the technique of positive matrix factorisation (PMF) was employed for source apportionment of aerosols and this showed to be highly useful when used with organic data from the Aerodyne Aerosol Mass Spectrometer (AMS), identifying specific factors describing unique particle types belonging to specific sources, including marine ones. Moreover, a specific factor linked with nucleation events was found.

The overall measurements of aerosol size distributions, chemical composition, hygroscopic properties and CCN concentrations associated with the remote sensing ones will elucidate the role of aerosol on the modification of cloud micro-physics and its radiative properties.