# Recurrent oxidized organic aerosol types over Europe from AMS and NMR measurements: results from EUCAARI project

Maria Cristina Facchini (1), Emanuela Finessi (1), Stefano Decesari (1), Lara Giulianelli (1), Marco Paglione (1), Risto Hillamo (2), Tomi Raatikainen (2), Colin D. O'Dowd (3), Astrid Kiendler-Scharr (4), Doug R. Worsnop (5), and the EUCAARI-NMR Team

(1) National Research Council (CNR), Institute of Atmospheric Sciences and Climate (ISAC), Bologna, Italy (mc.facchini@isac.cnr.it, +39-051-6399647), (2) Finnish Meteorological Institute, Air Quality Research, Helsinki, Finland;, (3) National University of Ireland, Environmental Change Institute, Galway, Ireland;, (4) Institut für Chemie und Dynamik der Geosphäre, Forschungzentrum Jülich, Germany, (5) Aerodyne Research, Inc., Billerica, MA, USA

The variability of OA composition over Europe has been explored during nine EUCAARI intensive field campaigns, by testing nuclear magnetic resonance (NMR) spectroscopy against AMS, beside to other well-established chemical and isotopic source apportionment techniques. Overall, NMR analysis complements the AMS characterization by providing information on the functionalities, such as aromatic groups and alcohols, to which AMS speciation is poorly sensitive.

Submicron aerosol samples devoted to NMR analysis were collected in a series of sites, such as: Hyytiälä (Mar-Apr 2007), San Pietro Capofiume (Mar-Apr 2008, and July 2009), Mace Head (May 2008), Melpitz (May 2008), Cabauw (May 2008), K-Puzsta (May-Jun 2008), Zurich (2009), and Barcelona/Montseny (2009). Collections of NMR spectra from each campaign were processed by factor analysis using a variety of algorithms and the resulting spectral profiles were interpreted based on their functional group distribution, by comparing with reference spectra provided by laboratory SOA and by chemical classes isolated from ambient samples with chromatographic methods (such as the humic-like substances, "HULIS").

Results show that the NMR factors broadly match with chemical classes already identified by AMS, with an overall good overlap between the two techniques in tracing the wood burning products at typical European polluted rural areas. Such biomass burning factor was particularly evident in early spring in San Pietro Capofiume (2008) where contributed for up to 60% of total concentrations of the water-soluble organics. The AMS low-volatility OOA clearly fit with water-soluble organics showing NMR "HULIS" features, which dominate the composition during the May 2008 IOP at all stations. NMR and AMS also trace analogous fractions of freshly formed OOA in the boreal forest, which can be attributed to biogenic SOA based on the results of EUCAARI laboratory experiments. These and others oxidized organic aerosol types recurrently isolated over Europe from co-located measurements will be presented in this work.