Insights into Dissolved Organic Matter Complexity in Rainwater from Continental and Coastal Storms by Ultrahigh Resolution Fourier Transform Ion Cyclotron Resonance Mass Spectrometry

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Results and Discussion

A series of seven rainwater samples were collected in Wilmington, North Carolina USA originating from both continental and coastal storms and analyzed by ultrahigh resolution Fourier transform ion cyclotron resonance mass spectrometry (FT-ICR MS). This data set is unique in that it represents a detailed comparison of the molecular level composition of DOM in rainwater collected from distinctly different air mass back trajectories by FT-ICR MS. Approximately 25% of the roughly 2000 assigned CHO molecular formulas are unique to a single storm classification indicating the importance of air mass back trajectory on the composition of rainwater dissolved organic matter (DOM). Analysis of the unique molecular formula assignments highlighted distinct groupings of various bio- and geo-molecule classes with coastal storms containing unique formulas representative of lignin and cellulose-like formulas while continental storms had lipid-like formulas. A series of 18 distinct methylene oligomers were identified in coastal storms and 13 unique methylene oligomers in continental storms, suggesting oligomer formation is ubiquitous in rainwater albeit different for each storm classification. Oligomers of small acids and C3H4O2 were detected in both storm types indicating their processing may be similar in both back trajectories. Condensed aromatic hydrocarbons were detected in continental storms with phenol moieties that are not as oxidized as similar compounds detected in aquatic DOM.

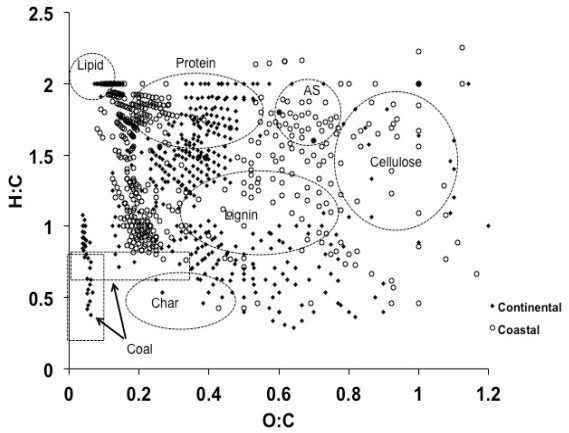

Figure 1 van Krevelen plot of unique assigned formulas containing CHO in continental and coastal storms. The indicated areas are based upon earlier literature descriptions (Kim et al., 2003).

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References

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