Local meteoric water lines and the spatial transformation of extratropical precipitation

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Availability of low cost liquid water isotopic cavity ring-down spectroscopy has led to widespread usage of stable water isotopes in capturing storm evolution at a variety of spatial and temporal scales. Local meteoric water lines (LMWLs) thereby generated are used to delineate the spatial transformation of a precipitating airmass and identify the localized climatic variables influencing $\delta^{18}O$ and δD isotopic signatures of precipitation. In this study a central Ohio LMWL was developed and analysed in relation to local climatic variables. Throughout the five-year sampling period, five extratropical precipitation events were captured. These events displayed no significant variation from the LMWL. While the isotopic composition of hurricanes has been used to delineate storm energy and temporal transformation, resulting extratropical systems have not been tracked in relation to LMWLs along the storm path. Consistencies found between the central Ohio LMWL and extratropical precipitation samples were further investigated using LMWLs generated at six USGS AIRMoN sites along the United States east coast and in the Ohio Valley[1]. Published data[2] from Superstorm Sandy were compared to the LMWLs. Results predominantly showed no significant variation in the storm samples from the LMWLs. Significant variation was seen for locations that were greater than 300 km from USGS AIRMoN sites or located along the coast. Our study highlights the importance of long-term sample sets to generate robust LMWLs and depicts the relationship between isotopic composition of extratropical precipitation and LMWLs.

[1] Coplen, T. B., Huang, R. (2000) *U.S. Geological Survey*. *Open-File Report 00-279.* [2] Good, S. P., Mallia, D. V., Lin, J. C., & Bowen, G. J. (2014) *PloS one*. *9*(3), e91117