Large-Scale Antecedent Conditions Associated with 2014–2015 Winter Onset over North America and mid-Winter Storminess Along the North Atlantic Coast

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Winter 2014–2015 began with a vengeance in mid-November 2014 over much of the CONUS east of the Rockies. The coldest November weather in 35 years was ushered in by a sequence of arctic air masses that progressively advanced eastward and southward across the CONUS. An epic lake-effect snowstorm that buried parts of western New York on 18–19 November was followed by a series of snow and ice storms that disrupted Thanksgiving holiday travel. Arctic air retreated poleward during the first part of December 2014, but returned in force over much of the eastern CONUS late in the month. Between mid-January and mid-February 2015, multiple extreme weather events that featured record-breaking monthly and seasonal snowfalls and record-breaking daily minimum temperatures were observed. Record-breaking monthly mean low temperatures in February 2015 were observed in many locations across the Great Lakes and Northeast, especially where deep snows had accumulated. At the same time, record-breaking warmth was observed in many parts of the Intermountain West and Rockies beneath a persistent western North American upper-level ridge.

This presentation will show how the evolution of the antecedent Northern Hemisphere (NH) circulation governed the initial onset of abnormally cold and stormy conditions over the CONUS east of the Rockies in November 2014. We will show how the recurvature and extratropical transition (ET) of Supertyphoon Nuri in the western Pacific in early November 2014, and its subsequent explosive reintensification as an extratropical cyclone (EC), disrupted the North Pacific jet stream and downstream NH circulation. The Nuri ET/EC produced high-latitude ridging and the formation of an omega block over western North America, resulting in downstream baroclinic development, downstream Rossby wave dispersion, and the development of a deep trough over eastern North America. This sequence of Nuri-induced NH circulation changes culminated in the aforementioned epic lake-effect snowstorm in western New York on 18-19 November 2014 and the subsequent storms that disrupted Thanksgiving travel.

Beginning in January 2015, a high-amplitude flow pattern developed that featured persistent high-amplitude ridges over northeastern Russia, Alaska, western North America, and the North Atlantic and deep troughs over the eastern North Pacific and eastern North America. This persistent amplified flow pattern supported the occurrence of frequent heavy snowstorms, including blizzards, over parts of the northeastern CONUS during the latter part of January and much of February 2015. The storm track associated with these snowstorms subsequently shifted southward into the Ohio and Tennessee Valleys in late February and early March in response to subtle changes in the NH circulation. The contributions of tropical and midlatitude forcing to the highly anomalous eastern CONUS winter 2014–2015 will be assessed.