IC4.3 Microclimate Exercise: The Finger Lakes Lake-Effect Snow Belt

Overview: The Finger Lakes lake-effect snow belt typically extends from Tompkins, southern Seneca and Schuyler counties south-southeast across Tioga county and sometimes across western Broome county. Lake effect snow southeast of the Finger Lakes typically brings accumulations of anywhere from 1 to 4 inches of snow to this area, however most winters will include a few intense events where up to 8 inches can fall in isolated locations.

Synoptic Scale Ingredients: Lake effect snow southeast of the Finger Lakes typically develops with a cold north to northwest flow. These events most often occur when surface high pressure is building east across the central Great Lakes area, and west or northwest low-level flow turns to a more northerly direction. As a result, these events often occur as lake effect snow across the rest of the upstate New York is starting to wind down.

Terrain Forcing / Local Ingredients. Lake effect snow occurs southeast of the Finger Lakes when a north-northwest flow traverses the long axis of the lakes. The Finger Lakes are deep and never freeze, and the long axis of the lakes are long enough to allow for the development of lake effect snow in north-northwesterly flow. The snow bands are typically most intense during the late night and early morning hours, when there may be a land-breeze component to the flow, which helps to promote convergence over the lake. The upstream moisture source provided by Lake Ontario is also a key factor that helps to produce snow in these situations. Finally, a north-northwest flow is an upslope flow across this part of the central New York, as the terrain rises from the low-lying lake plain south of Lake Ontario, to the rugged Allegheny Plateau region of southern New York.

Diagnosis and Prognosis For a typical event (1 to 4 inches), forecasters should look for surface high pressure building east across the central to northern Great Lakes, with the low-level flow turning from northwest to north (typically from 330 to 350 degrees). Models will often forecast a light, anticyclonic low-level flow across the area, as the surface high builds east across the area. The associated subsidence inversion is often found between 900 and 850 mb; which is lower than for most significant lake effect snow events. The thermal profile beneath the subsidence inversion will typically feature a significant depth with values between -12 and -18 degrees C, which is favorable for dendritic snow crystal growth. The small-scale nature of these events means that the GFS will often forecast no precipitation, while the NAM may forecast a small area of very light (less than 0.10 inches) precipitation. Forecasters should be especially wary that these events can intensify during the late night and early morning hours, when a land-breeze component to the flow often develops and helps to promote convergence over the lake. The snow bands often become less organized and less intense during the late morning through early evening hours.

Heavier events still feature a 330 to 350 degree low-level flow, however the rest of the environment is more typical of what might be associated with a significant lake effect snow event elsewhere in upstate New York. In these events, a significant mid-level short wave may be moving across the area, and the surface high pressure will be farther to the

west. As a result, inversion heights will be higher (between 850 and 500 mb), with ample moisture beneath the inversion. Both the GFS and NAM will typically forecast some light precipitation, but will usually still be too dry. The strongest events have been shown to occur when a convergence zone sets up between a very cold, dry northerly flow that originates east of Lake Ontario, and a moister northwesterly flow that travels across the central or western portion of Lake Ontario.