Quantification and Analysis of Mechanisms for the Foehn Effect in the January 2016 West Antarctic melt event

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The Ross Ice Shelf (RIS) buttresses ice streams from the Antarctic continent and restrains the grounded ice sheet from flowing into the ocean. The loss of ice shelves that results from the combined atmospheric and oceanic factors can promote glacier acceleration into the sea and increase the instability of ice sheets. During the summer, all Antarctic ice shelves are currently experiencing surface melting, which may continuously occur over the West Antarctic ice shelves in the future. In January 2016, a major melt event occurred on the eastern side of RIS. Only a few summer melt events of this magnitude have been observed since 1979, and they share similar melting patterns. The melting usually starts near Siple Dome (between Shirase Coast and Siple Coast) and then expands towards the western RIS. To our knowledge, limited research has been conducted on the melting that occurs on the RIS. The analysis of the 2016 melt event will help us identify the factors that lead to the melting in this specific location. Continuing the research that we presented at the 2017 Workshop on Antarctic Meteorology and Climate, we introduce a more detailed investigation of the meteorology of the 2016 melt event based on the model output from the Antarctic Mesoscale Prediction System (AMPS). The warm air advection over the Amundsen Sea intruded into Marie Byrd Land, which brought warm and moist air inland. Compared to our previous work, we conducted more backward trajectories to better cover the melting area. Based on trajectory analysis, the foehn effect, caused by the mountains along the coast of Marie Byrd Land, amplified the surface warming by up to 4 °C at the beginning of the melt event. This presentation will describe the foehn effect observed on the RIS during the 2016 melt event, as well as its magnitude and physical mechanisms. This study is building a better understanding of the foehn effect over RIS, which is related to its stability.