Snowfall Measurements in the Amundsen and Bellingshausen Seas

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Models and sea ice surveys suggest snowfall has increased in the Amundsen - Bellingshausen sector of West Antarctica over the past several years. During 2007 we measured the frequency of precipitation on two research cruises aboard the *Nathaniel B. Palmer*, using photoelectric particle counters mounted approximately 30m above sea level. These devices are not triggered by extremely small particles or by rime, but their ability to record precipitation is a function of their orientation (parallel to the ship's heading) relative to the wind field. Records from an austral summer (February – March) oceanography cruise through the Ross and Amundsen Seas were influenced by the ship's motion through the water: the resulting apparent wind led to particle under-counting. Snowfall was generally greater away from the coastline, consistent with observations of strong southerly winds transporting very fine snow off of ice shelves. During a September – October sea ice drift experiment in the Bellingshausen, the ship was stationary much of the time, so records of precipitation intensity were related to true wind direction and speed. Synoptic storms led to significant precipitation events in both records, but the ship-based data indicate that some precipitation occurred almost every day. We believe that the particle counters recorded "snowflakes" falling frequently in the Amundsen and Bellingshausen Seas, consistent with daily ECMWF precipitation forecasts. Preliminary results suggest that a relationship between forecast water-equivalent precipitation and number of snowflakes may exist, but calculation of the water equivalent precipitation indicated by a ship-based snowflake count requires more

accurate snowfall particle size distribution data. Future measurement campaigns should include at least two particle counters measuring simultaneously with perpendicular orientations to remove under-sampling of snow in adverse wind conditions, and collection of samples for particle size characterization.