In this presentation, we report on the progress made for the development of a new snowfall detection algorithm using the Advanced Technology Microwave Sounder (ATMS) measurements. To this end, ATMS data from the NPOESS Preparatory Project (NPP) satellite for the 2011-2013 snow seasons have been collected and collocated with in-situ surface meteorological measurements over continental US and Alaska. Next, the ATMS data are examined (with respect to surface "ground truth") for their ability to detect snowfall with minimum false alarm. Probability of snowfall is computed using logistic regression. Statistical algorithms using different combination of ATMS channels and filters are compared. The utility of Principal Component Analysis is also evaluated.