Air traffic delays are primarily due to complications arising from weather constraints on the air space. This presentation will discuss ongoing research efforts in the field of Air Traffic Management (ATM). In particular, the talk will touch base on research issues that are driven by the modeling and forecasting of weather hazards, and the usage of hazardous weather forecasts in ATM decision support tools. ATM planning for individual flights and overall traffic flow requires weather information with lead times of up to six hours, and beyond. This provides for a significant challenge given the inherent uncertainty of predicting weather several hours in advance. Thus, ATM decision support tools will be using probabilistic weather forecasts for assessing risks associated with particular flight plans. This presentation will discuss the current state of the art of today's ATM system and highlight how future ATM systems may approach the weather-related air traffic flow management challenge. Although the talk will report on research findings from the past, it will be geared more toward brainstorming about research needs for the future.