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Modeling the weather impact on aviation in a global air traffic model

S. Himmelsbach (1), T. Hauf (1), and C. H. Rokitansky (2)

(1) Institute of Meteorology and Climatology, Leibniz Universität Hannover, (2) Department of Computer Sciences, University of Salzburg

Weather has a strong impact on aviation safety and efficiency. For a better understanding of that impact, especially of thunderstorms and similar other severe hazards, we pursued a modeling approach. We used the detailed simulation software (NAVSIM) of worldwide air traffic, developed by Rokitansky [Eurocontrol, 2005] and implemented a specific weather module. NAVSIM models each aircraft with its specific performance characteristics separately along preplanned and prescribed routes. The specific weather module in its current version simulates a thunderstorm as an impenetrable 3D object, which forces an aircraft to circumvent the latter. We refer to that object in general terms as a weather object. The Cb-weather object, as a specific weather object, is a heuristic model of a real thunderstorm, with its characteristics based on actually observed satellite and precipitation radar data. It is comprised of an upper volume, mostly the anvil, and a bottom volume, the up- and downdrafts and the lower outflow area [Tafferner and Forster, 2009; Kober and Tafferner 2009; Zinner et al, 2008]. The Cb-weather object is already implemented in NAVSIM, other weather objects like icing and turbulence will follow.
This combination of NAVSIM with a weather object allows a detailed investigation of situations where conflicts exist between planned flight routes and adverse weather. The first objective is to simulate the observed circumnavigation in NAVSIM. Real occurring routes will be compared with simulated ones. Once this has successfully completed, NAVSIM offers a platform to assess existing rules and develop more efficient strategies to cope with adverse weather.
An overview will be given over the implementation status of weather objects within NAVSIM and first results will be presented.

Cb-object data provision by A. Tafferner, C. Forster, T. Zinner, K. Kober, M. Hagen (DLR Oberpfaffenhofen) is greatly acknowledged.

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