Nowcasting Aircraft Icing Conditions in Moscow Region Using Geostationary Meteorological Satellite Data

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Nowadays the Main Aviation Meteorological Centre in Moscow (MAMC) provides forecasts of icing conditions in Moscow Region airports using information of surface observation network, weather radars and atmospheric sounding. Unfortunately, satellite information is not used properly in aviation meteorological offices in Moscow Region: weather forecasters deal with satellites images of cloudiness only. The main forecasters of MAMC realise that it is necessary to employ meteorological satellite numerical data from different channels in aviation forecasting and especially in nowcasting.

Algorithm of nowcasting aircraft in-flight icing conditions has been developed using data from geostationary meteorological satellites "Meteosat-7" and "Meteosat-9". The algorithm is based on the brightness temperature differences. Calculation of brightness temperature differences help to discriminate clouds with supercooled large drops where severe icing conditions are most likely. Due to the lack of visible channel data, the satellite icing detection methods will be less accurate at night. Besides this method is limited by optically thick ice clouds where it is not possible to determine the extent to which supercooled large drops exists within the underlying clouds. However, we determined that most of the optically thick cases are associated with convection or mid-latitude cyclones and they will nearly always have a layer where which supercooled large drops exists with an icing threat.

This product is created hourly for the Moscow Air Space and mark zones with moderate or severe icing hazards. The results were compared with mesoscale numerical atmospheric model COSMO-RU output. Verification of the algorithms results using aircraft pilot reports shows that this algorithm is a good instrument for the operational practise in aviation meteorological offices in Moscow Region. The satellite-based algorithms presented here can be used in real time to diagnose areas of icing for pilots to avoid.