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Various aviation hazards, one common tracker: Tropopause Folding for Clear Air Turbulence and Volcanic Ash plume

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Monitoring in Near Real Time regime the very different features potentially hazardous for aviation ,including volcanic ash (VA) plumes and Clear Air Turbulence (CAT), is a challenge for any aviation weather forecaster. The aim of this work is to develop a conceptual model for identifying the existence and horizontal extent of CAT area and a presumptive VA plume transport, using the Jet Stream position and the associated tropopause folding. Tropopause folding areas are associated with high probability of CAT occurrence and it is identified on the sharp boundaries in Water Vapor satellite images indicating a transition from dry to moist air masses. The sinking dry stratospheric air is connected to the lower dynamic tropopause by ageostrophic forcing,near to the Jet entrance, displaying areas with strong gradients in the height of the PV=1.5 PVU surface. Tropopause fold extends from this boundary of sharp WV gradient to a limited distance into and underneath the wetter air mass. Therefore, the challenge is to identify this extent and to make the correlations with CAT or, by case, with VA plume transport. Stratospheric air sinking determines a strong ozone intrusion from upper to lower levels of the atmosphere and tracking the ozone layer changes with satellite imagery could be a very useful tool for monitoring tropopause fold. Regarding the VA cloud monitoring, because the microphysical and optical proprieties of the volcanic ash particles are very close to the dust particles in terms of satellite imagery interpretation, we considered that the analysis of VA cloud extension should be very similar. In this respect, the case 23-rd of March 2018 concerning a deep intrusion of Saharian dust over south-eastern Europe, correlated with upper-air reports of CAT might be relevant in developing a conceptual model, creating a bridge between theoretical approach and aircraft observation with empirical relationships. In order to make the correlations between CAT and dust layer presence we investigate the Aviation Significant Weather charts, observation data from Bucharest, Sofia, Belgrade soundings and Aircraft Meteorological Data Relay (AMDAR) messages. Also “dust” RGB, ozone and WV channels from METEOSAT, wind fields and PV1.5 height products from ECMWF provided the most eloquent information for this study.