Ticosounding Turrialba – Profiles of Volcanic Sulfer Dioxide (SO_2) in Costa Rica and Validation for OMI and OMPS

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The summit of Volcan Turrialba (elev. 3340 m) lies less than 50 km upstream in the prevailing easterlies from the Ticosonde balloon launch site at San Jose, Costa Rica, where ECC ozone sondes have been launched regularly since 2005. In 2006 we began to see telltale notches in the ozone profiles in the altitude range between 2 and 6 km. Given the proximity of Turrialba, it seemed likely that SO_2 in the volcano's plume was interfering in the chemical reaction in the electrochemical concentration cell (ECC) ozone sonde used to detect ozone. In early 2010, fumarolic activity in the Turrialba crater increased strongly, and the profile notches in our soundings increased in frequency as well, consistent with this hypothesis. Since July 2013 we have made frequent launches of a dual ECC sonde system, where an additional sonde is flown on the same payload using a selective SO_2 filter. The difference of the measurements in the dual sonde is a direct measure of the amount of SO_2 encountered as opposed to the inferred estimate that can be made with a single ozonesonde. Through March 2015, we have made 28 dual sonde launches, 18 of which have detectable SO_2 notches. Figure 1 shows profiles ozone and SO_2 for the launch on March 13 this year which took place during the most significant ash eruption from Turrialba in over 100 years. Comparisons of the dual sonde measurements to the single-sonde inferred measurements show that the latter, while biased low, are tightly correlated to the former. With this result we are able to use the nearly 100 notch events going back to 2006 for validation of the SO_2 retrievals from the Ozone Monitoring Instrument (OMI) on Aura and more recently Ozone Mapping and Profiler Suite (OMPS) on Suomi/NPP.

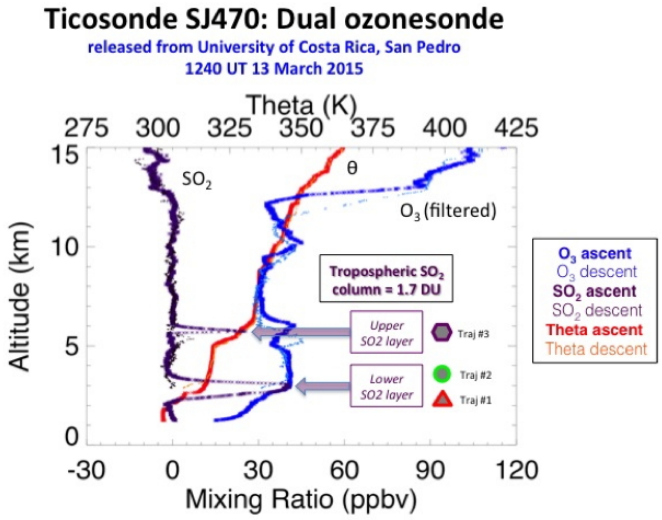

Figure 1. Profiles of ozone, SO_2 and potential temperature for the dual ozone sonde launch from San José, Costa Rica, 13 March 2015.