Supplementary Figures for

"Carbon balance of South Asia constrained by passenger aircraft CO_2 measurements"

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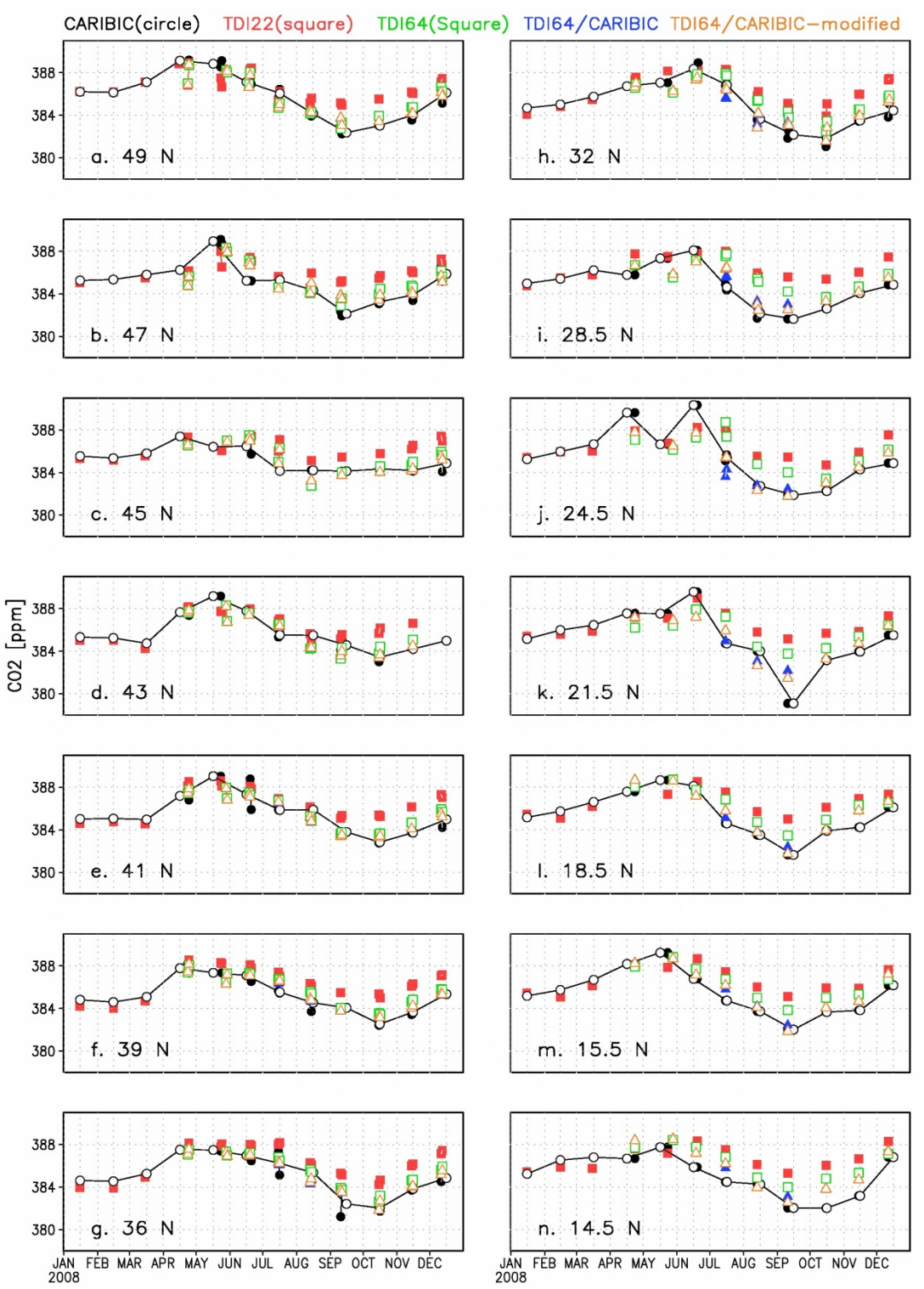
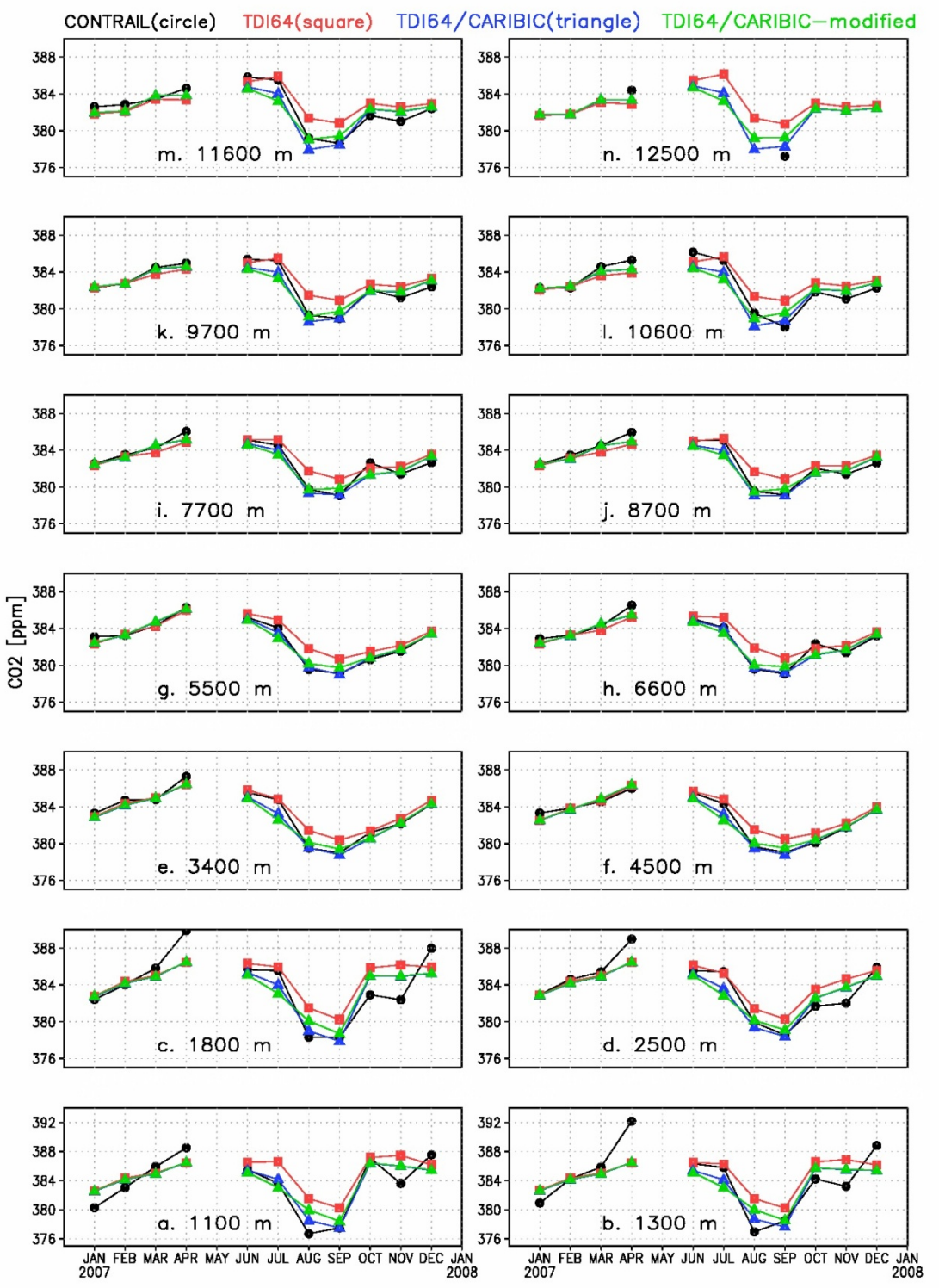
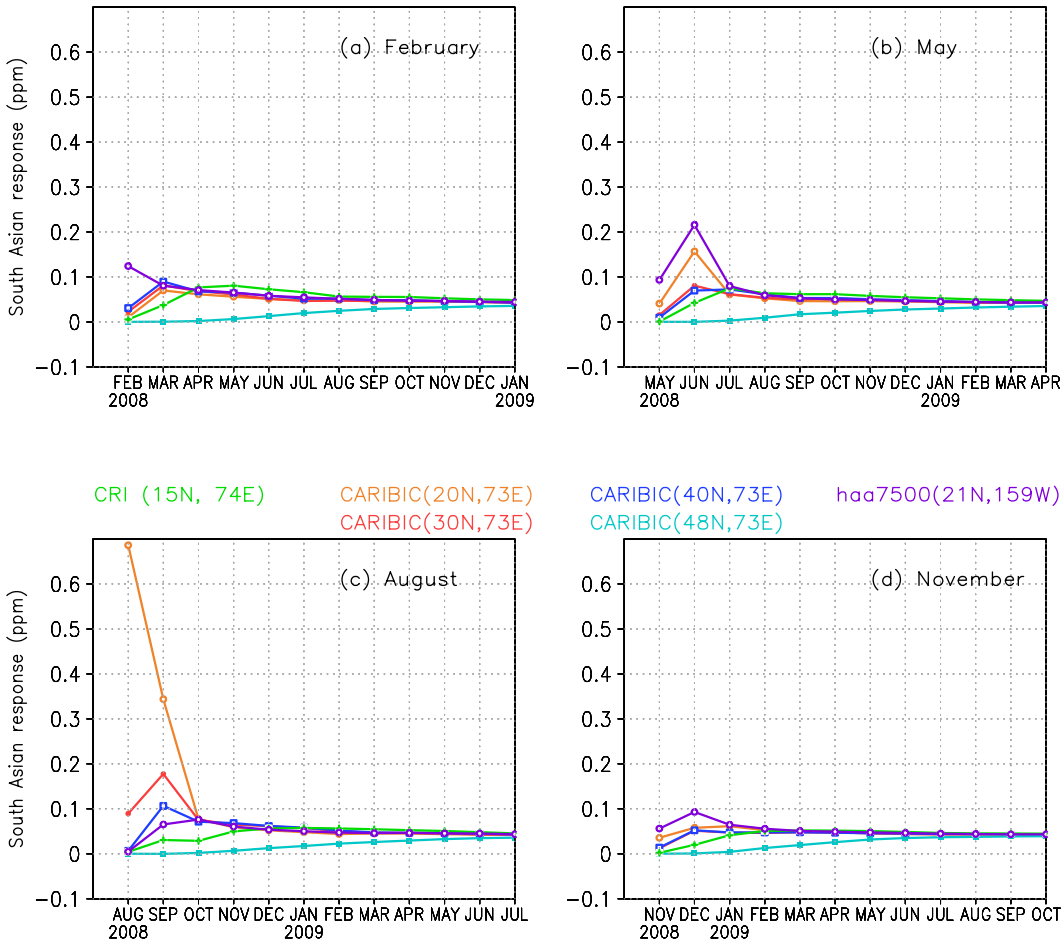


Supplementary Figure 1: CO_2 seasonal cycles as seen from CARIBIC (solid circles) and comparison with ACTM simulations for TDI22 and 3 cases of TDI64 fluxes. The whole year seasonal cycles are prepared by combining CARIBIC data with TDI22 results and linear interpolation are shown as solid line/open circles, which is required for ingesting the CARIBIC data into the inverse model. The differences between forward simulations using TDI64/CARIBIC and TDI64/CARIBIC-modified are minimal, except for July in the latitude range of 21.5–32^{o} N.



Supplemental figure 2: Comparisons of CO_2 seasonal cycles measured by CONTRAIL and ACTM model simulations at different altitudes over Delhi. These plots are consistent with the CONTRAIL vertical profile figures (Figs. 4a & 4b) and associated text.



Supplementary Figure 3: Timeseries of response functions for 1.0 PgC/yr emission from the South Asia region of TDI64 are plotted. The responses sampled at (1) CRI, India surface site, (2) 4 selected/representative CARIBIC locations and (3) Hawaii at 7500 m (haa7500), which is located within the latitude range of South Asia region. Note that the response at haa7500 is generally greater for the first month of simulation during Feb, May and Nov. Because the vertical transport is not efficient, compared to the horizontal advection, during these months the South Asian flux signal first sampled further away, and later over the South Asia after the air is zonally well mixed. During the monsoon months of August, however, the South Asian signal is captured at the CARIBIC flight level due to vertical transport of flux signal by the deep cumulus convection.