

## **Online Supplemental Material**

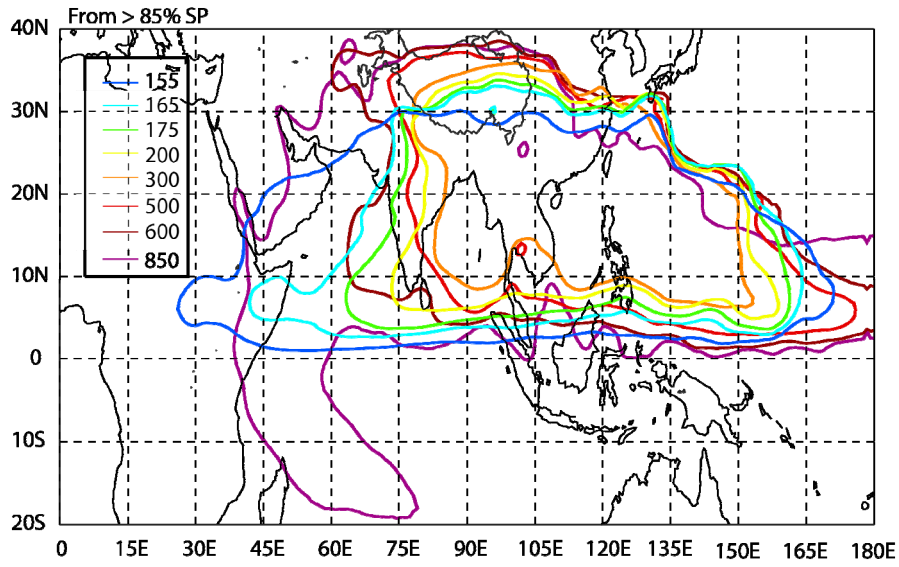
### **Atmospheric boundary layer sources for upper tropospheric air over the Asian summer monsoon region**

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The vertical conduit of air mass pathway is shown in Figure A. The area (enclosed by closed curves with different colors) including 60% of total parcels (hereafter, 60% area is used to denote this area), which gather all the grids with larger percentage, at different levels (from 850 hPa to 155 hPa). At the lowest level (i.e. 850 hPa), 60% area is very large, and includes the main ABL sources as shown in the main text Figure 3. At the level of 600 hPa, 60% area shrinks quickly to a much smaller area, where has intensive strong convections as shown by lower values of OLR in the main text Figure 2. At levels from 500 hPa to 175 hPa, 60% area has relatively little change, which suggests that there seems to a conduit among these levels. At higher levels, 60% area expands quickly at zonal direction, which is caused by strong easterly at higher levels.

60% Parcels from BL to 150hPa, 2009To2014



**Figure A** Area, enclosed by closed curves with different colors at different levels, includes 60% of total parcels.