2 **Figure S1**: Scatterplots of total extinction angstrom exponent (EAE) versus aerosol optical depth
3 (AOD, 500 nm). The red circles indicate when AOD exceeded 1.

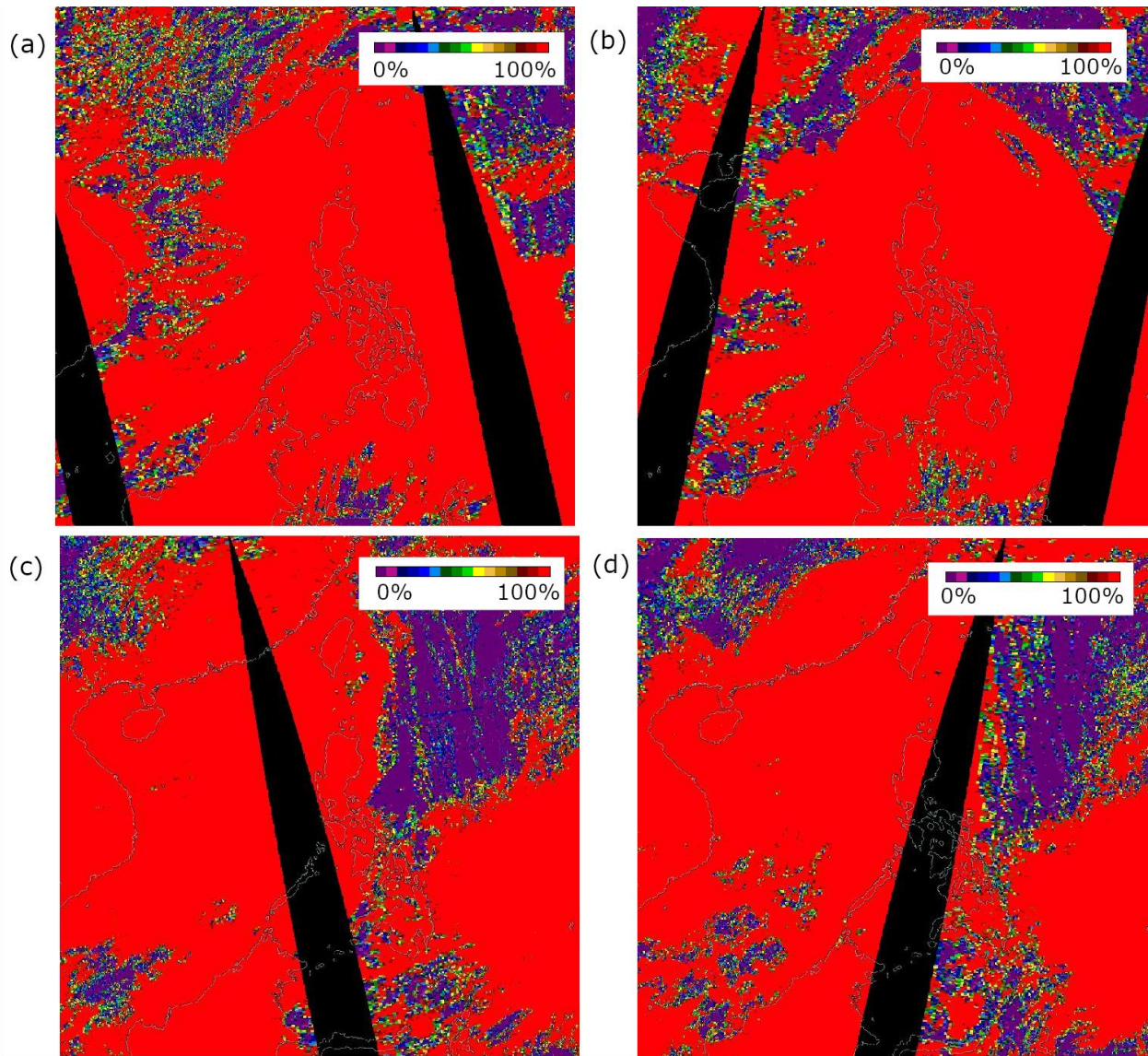



Figure S2: Cloud fraction images from (a/c) Aqua / MODIS and (b/d) Terra / MODIS satellite products. These are day-time snapshots during the back-trajectory periods: (a/b) 24 August 2009 at 00:00 UTC and (c/d) 25 August 2009 at 00:00 UTC. Red areas in panels show where there is 100% cloud fraction.

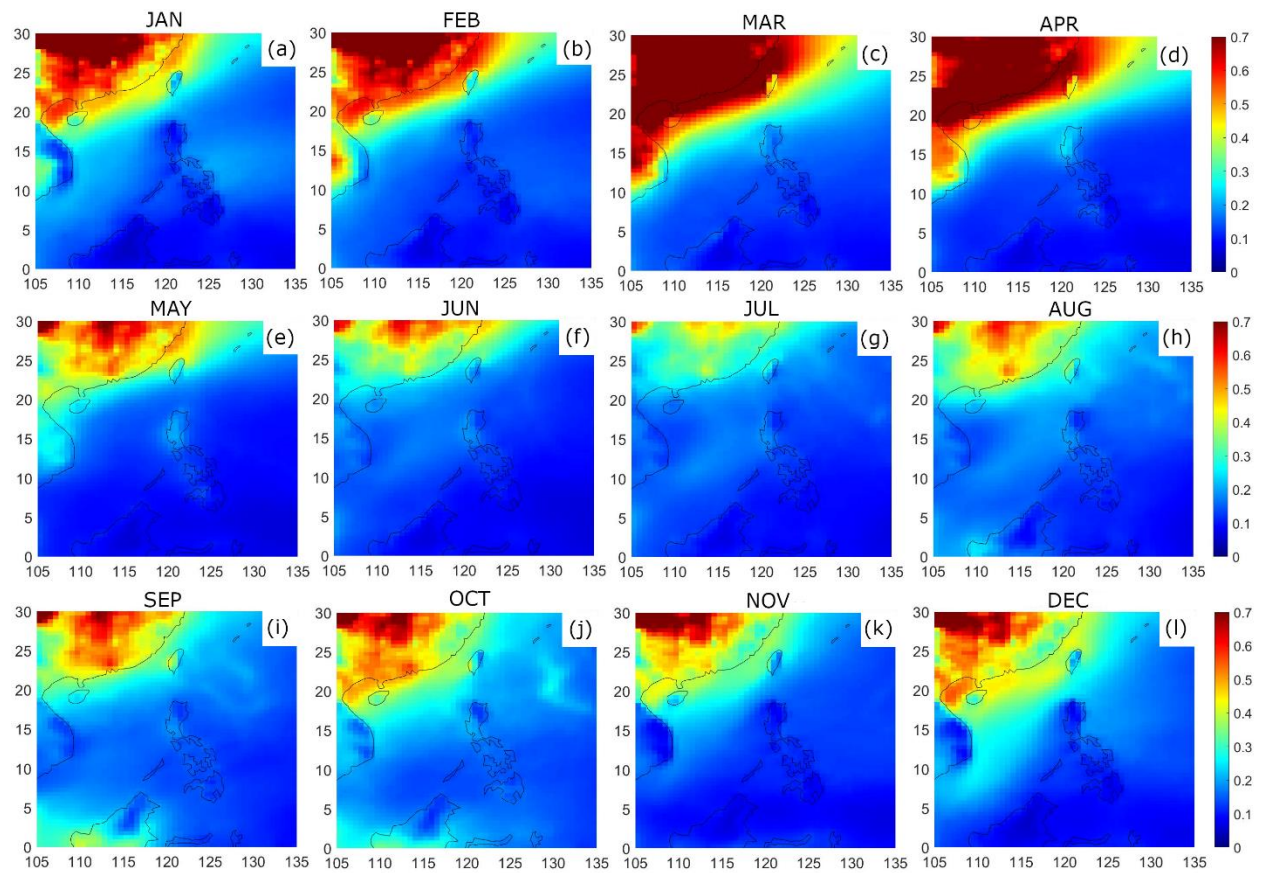
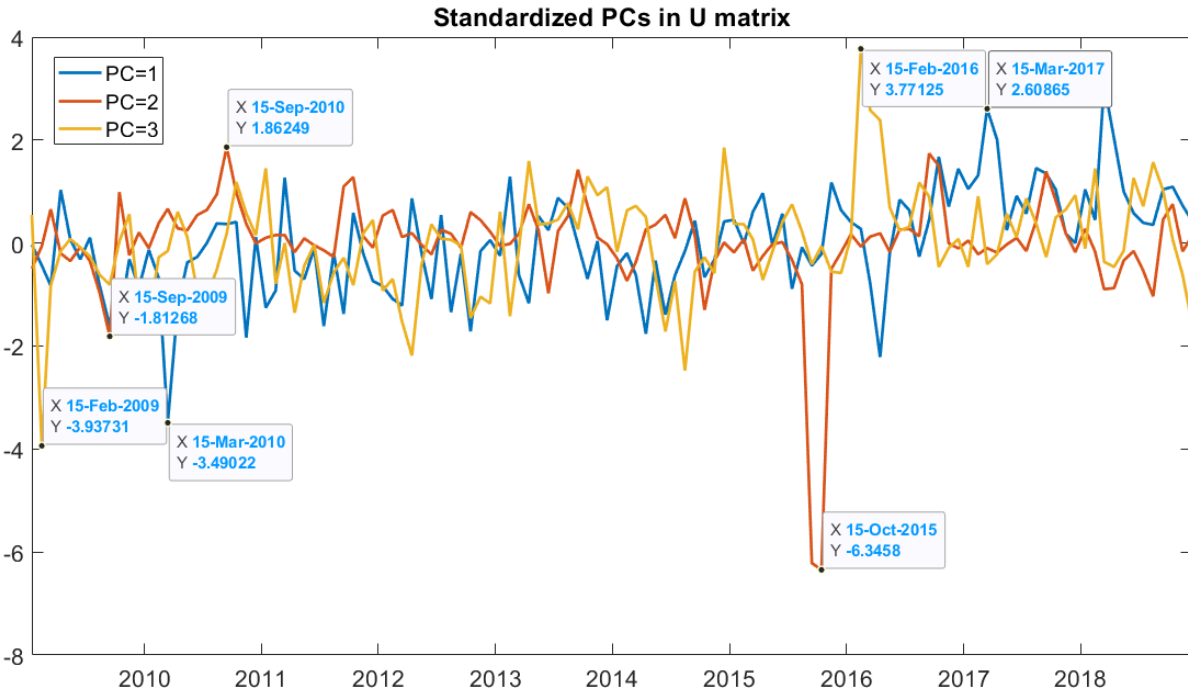



Figure S3: Monthly mean MERRA-2 aerosol optical depth (extinction at 550 nm) from 2009 to 2018 in Southeast Asia.

12
13 **Figure S4:** Time series of standardized principal components. Maximum and minimum values
14 per principal component are annotated with the month of occurrence.