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How Extreme Apparitions of the Volcanic and Anthropogenic South East Asian Aerosol Plume Trigger and Sustain El Niño events using data from the Last Millennium Ensemble, Large Ensemble, MERRA-2 Reanalysis, four Satellites and the Global Volcanism Program.

Keith Potts

Cumberland Park, Australia (keith.potts@bigpond.com)

Volcanic aerosols over south east Asia have always been the trigger and sustaining cause of ENSO events. In recent decades this natural plume has been augmented by the anthropogenic plume which has intensified ENSO events especially in SON. Data from the Last Millennium Ensemble (13,872 months), and Large Ensemble (3,012 months) demonstrate this connection with three ENSO indices and aerosol data derived from the same datasets correlating at 1.00 (LME), 0.97 and 0.99 magnitude (segmented and averaged). ENSO events are the dominant mode of variability in the global climate responsible for Australian, Indian and Indonesian droughts, American floods and increased global temperatures. Understanding the mechanism which enables aerosols over SE Asia and only over SE Asia to create ENSO events is crucial to understanding the global climate. I show that the South East Asian aerosol Plume causes ENSO events by: reflecting/absorbing solar radiation which warms the upper troposphere; and reducing surface radiation which cools the surface under the plume. This inversion reduces convection in the region thereby suppressing the Walker Circulation and the Trade Winds which causes the SST to rise in the central Pacific Ocean and creates convection there. This further weakens/reverses the Walker Circulation driving the climate into an ENSO state which is maintained until the aerosols dissipate and the climate system relaxes into a non-ENSO state. Measured aerosol data from four NASA satellites, estimates of volcanic tephra from the Global Volcanism Program (GVP) for over 100 years and the NASA MERRA-2 reanalysis dataset all confirm this analysis.