

## **Abstract**

In order to map suitable areas for weather modification in East Africa Community (EAC), investigations were performed to determine spatio-temporal variability and relationship of aerosol, clouds and precipitation during March-April-May (MAM) and October-November-December (OND). Principal Component Analysis (PCA), Hybrid Single-Particle Lagrangian Integrated Trajectory (HYSPLIT) and Multivariate Regression Analysis (MRA) were used. Identification of near homogeneous zones of Aerosol Optical Depth (AOD), Fine Mode Fraction (FMF), Cloud Top and 3B42 Tropical Rainfall Measuring Mission (TRMM) yielded 13 (14), 20 (18), 11 (10) and 16 (17) significant Principal Components (PCs) for MAM (OND) with explained variance greater than 57%. Aerosols and clouds had positive relationship with precipitation in areas with strong factor loadings. MRA indicated independence of variables used and normality in the model residuals. Backward trajectory analysis indicated differences in origins of transported particles in the atmosphere with strong vertical mixing inlands with mixed aerosols resulting due to mountain blocking systems accounted for enhanced rainfall. Enhanced rainfall was attributed to highly varied AOD and unaffected FMF in the atmosphere. Locations east and west EAC with mean temperatures greater than  $-10^{\circ}\text{C}$  were unsuitable for cloud seeding while central EAC region along the great rift-valley and coastal Tanzania exhibited optimal temperatures suitable for cloud seeding. Successful precipitation enhancement will increase available fresh water sources and thus alleviate existing and projected water stress.