

Spatial and Temporal Analysis of Drought in Nepal using Standardized Precipitation Index and its Relationship with Climate Indices

M. Sigdel¹ & M. Ikeda¹

¹*Graduate School of Environmental Science, Hokkaido University, N10 W 5, Sapporo Graduate School Hokkaido 060-0810, Japan*

E-mail: sigdelbro@gmail.com

ABSTRACT

Drought over Nepal is studied on the basis of precipitation as a key parameter. Using monthly mean precipitation data for a period of 33 years, Standardized Precipitation Index (SPI) is produced for the drought analysis with the time scale of 3 months (SPI-3) and 12 months (SPI-12) as they are applicable for agriculture and hydrological aspects, respectively. Time-space variability is explored based on Principal Component Analysis (PCA) along with Rotated PCA (RPCA). Four rotated components were explored for both SPI-3 and SPI-12 representing climatic variability with cores over eastern, central and western Nepal separately. Droughts associated with SPI-3 occurred almost evenly over these regions. Droughts associated with SPI-12 were consistent with SPI-3 for summer, since summer precipitation dominates annual precipitation. Connection between SPI and the climate indices such as Southern Oscillation Index (SOI) and Indian Ocean Dipole Mode Index (DMI) was studied, suggesting that one of the causes for summer droughts is El Nino, while the winter droughts could be related with positive DMI.

Keywords: Standardized Precipitation Index, Nepal, Principal component analysis, Drought