

The Asian summer monsoon (ASM) is a high-dimensional and highly complex phenomenon affecting more than one fifth of the world population. The intraseasonal component of the ASM undergoes periods of active and break phases associated respectively with enhanced and reduced rainfall over the Indian subcontinent and surroundings. In this thesis the nonlinear nature of the intraseasonal monsoon variability is investigated using the leading Empirical Orthogonal Functions of ERA-40 sea level pressure reanalyses field over the ASM region. The probability density function is then computed in spherical coordinates using the Epaneshnikov kernel method. Three significant modes are identified. They represent respectively (i) the East - West mode with above normal sea level pressure over East China sea and below normal pressure over Himalayas, (ii) the mode with above normal sea level pressure over East China sea (without compensating centre of opposite sign as in (i)) and (iii) the mode with below normal sea level pressure over East China sea (same as (ii) but with opposite sign). The relationship with large-scale forcing is also investigated by stratifying the PCs according to representing indices. The regimes derived from spherical PDFs appear to be opposite under opposite large-scale conditions. EOF technique with the spherical PDF estimation is also used to resolve the question if there is shift in patterns before and after 1979. Various maxima of the spherical PDF changed its coordinates and probability level after 1979, resulting in different regimes.