

# Global Warming and ENSO Indian Monsoon Relationship

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The subject of impact of the El Nino Southern Oscillation (ENSO) phenomenon on the Indian Monsoon Rainfall(IMR) has been known for nearly 100 years since the times of Sir Gilbert Walker. During last two decades sufficient evidence has been accrued for the links between ENSO and IMR. In general studies have shown that the warm phase (ie El Nino) is associated with weakening of the Indian Monsoon with overall reduction in rainfall while the cold phase (ie La Nina) is associated with enhancement of rainfall. However none of the El Ninos after 1990s have had any adverse impact on IMR. Thus some changes in ENSO-IMR relationship have been recently noted.

## 1. Introduction

Several reasons are attributed to these changes (a) Modulation by the decadal variability of IMR, (b) North Atlantic Oscillation, (c) Indian Ocean Dipole, (d) Chaotic nature of monsoon and (e) Global Warming. This article examines the relationship of IMR with Darwin Pressure Tendency( index of ENSO ) and with Northern Hemisphere surface air temperature and western Eurasia snow ( indicators of Global Warming ) using more than 100 years data( 1871-2000 ) to investigate whether the recent ENSO-IMR weakening is really due to the Global Warming or the changing relationship is just a part of natural climate variability.

## 2. Data , Method of Analysis and Results

(i) Indian Monsoon Rainfall (IMR) data for the period 1871-2000

(data available on website [www.tropmet.res.in](http://www.tropmet.res.in))

- (ii) Darwin Pressure Tendency (DPT) representing the state of the ENSO phenomenon for the same period 1871-2000.
- (iii) Northern Hemisphere Surface Temperature ( NHST ) as an indicator for Global Warming for the period 1871-2000.
- (iv) Snow depth over western Eurasia ( Kripalani and Kulkarni, 1999 ) as an indicator for Eurasian Warming for the period 1881-1995.

### 3. Conclusions

The fact that the relationship of IMR with NHST and Snow have also weakened in recent times does not support Global Warming as a possible cause for the recent ENSO-Monsoon weakening. These changing relationships may be just a part of natural climate variability.