Increased sea surface temperature affecting Indian monsoon: Study

New Delhi, Oct. 02 (India Science Wire): The agricultural sector plays a key role in the economy of India and twenty-five other East Asian developing countries across a distance of 18,000 km (from east to west) and 6,000 km (from south to north). The main influencing factor in Indian agriculture is the southwest monsoon season from June to September caused by the cross-equatorial winds that blow from a southwesterly direction. The source of this wind is located more than 4,000 km away from India near the Mascarene Islands in the Southern Indian Ocean (SIO). The state of agriculture that includes forestry, hunting, fishing as well the cultivation of crops and livestock production is determined by this southwest monsoon. The climate across the world is however changing in many ways triggered by different global warming phenomena resulting in a change in the monsoon onset time and pattern which is badly affecting the agricultural yields as most of the important crops are seasonal and their water demand is mainly met by the water received from rainfall. Any excess or little rainfall is therefore detrimental to these crops.

The Mascarene Islands is a group of islands in the Indian Ocean east of Madagascar from where the cross equatorial winds blow to India. It is also called the Indian Ocean subtropical high, which is a high-pressure area located between 20° to 35° South latitude and 40° to 90° East longitude. The southwest monsoon caused by this high pressure area is the strongest component of the Indian subcontinent monsoon that contributes about more than 80% of the annual rainfall in entire East Asia. It is also the principal water supply source for more than a billion people in this region. Many climate modes /factors modulate the monsoon and one of the factors is Mascarene high influence.

Now, a new study on variability in the Mascarene High (MH) during global warming hiatus (GWH) led by National Centre for Polar and Ocean Research Goa (NCPOR Goa) revealed that the MH region experienced significantly increased Sea Surface Temperature (SST) during this period. A global warming hiatus is referred to as a global warming pause or a global warming slowdown, which is a period of relatively little change in globally averaged surface temperatures but this can result in the increase in the SST. This warming in SST resulted in decrease in the pressure gradient between the
MH and the Indian landmass, which in turn suppresses the intensity of low-level cross-equatorial winds over the western Indian Ocean affecting the onset of the monsoon over the Indian subcontinent and rainfall over East Asia.

These are alarming findings for a country whose food production and economy depend heavily on monsoon rainfall. As per NCPOR scientists, the weakening of the MH in the Southern Indian Ocean during GWH may affect the strength of the upwelling along the coast of Somalia and Oman and thus influence the Arabian Sea ecosystem. During the study, it was found that increased sea level and heat content in the MH region during the GWH (1998-2016) suppressed the intensity of low-level cross-equatorial winds.

NCPOR scientists have also investigated the recent warming trends in MH during GWH period and found a significant positive trend in SST, sea surface height (SSH) and oceanic heat content (OHC). Out of which, SST impacted more on the monsoon with rainfall
during the last 18 years. Scientists, therefore, call for urgent steps to reduce greenhouse gas emission to avert the associated risk of climate change effect, including killer heatwave and stop flooding from snow and glacier melting caused by rising temperatures.


Keywords: Mascarene High (MH), Southern Indian Ocean, Global Warming Hiatus, sea surface temperature, southern Monsoon, Arabian Sea ecosystem, NCPOR