Greenhouse Gases, Aerosols and Monsoon

J.Srinivasan

Divecha Centre for Climate Change, Indian Institute of Science, Bangalore, India

What will be the impact of climate change on the intensity of monsoons? This issue has attracted a lot of attention during the past 30 years. Most climate models predict that the direct impact of an increase in greenhouse gases will be an increase in monsoon rainfall. The indirect impact of greenhouse gases can, however, be more complicated. If the increase in greenhouse gases leads to a more frequent occurrence of El Nino in the Pacific Ocean, then it will lead to a decrease of Indian monsoon rainfall and an increase in rainfall in USA. The impact of increase in greenhouse gases on the spatial pattern of sea surface temperature in the Indian Ocean is not clear. The impact of increase in sulfate aerosols is a decrease in monsoon rainfall. The impact of soot aerosols on monsoons is not obvious since the presence of soot aerosols decreases the land temperature but warms the atmosphere by direct absorption of solar radiation. The impact of greenhouse gases and aerosols on the sea surface temperature in the Indian Ocean has not been understood so far. In the models used in IPCC AR4, half the models predict a decrease in Indian monsoon rainfall in the 21st century while others predict an increase in monsoon rainfall. The large divergence among the models is partly on account "cold bias" in sea surface temperature in the coupled ocean-atmosphere models and also on account of the difference in the way clouds change in response to global warming in these models.