Climate Change and Severe Convictive Weather Phenomena

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I. INTRODUCTION

A traditional view of this interaction is that the synoptic-scale processes simply provide a setting in which severe convection develops (Johns, 1982). This view could be interpreted as implying that convection has little or no direct impact on synoptic scales. However, there have been many recent developments in mesoscale meteorology as it relates to severe convection in weather phenomena. The impact of climate change is of enormous concern, which threatens to earth system. A temperature change has already been observed from the normal temperature by +1°C (30 years average), an increase that is twice the global change for the same period (0.5°C). Modeled climate variability that is expected suggests more frequent freezing rain events, increased amounts of precipitation and number of heat waves. The climatic variations in turn causes ecosystem shift such as habitat loss, invasion and threats from non-native species, as well as species extinction.

If advanced technologies like Remote Sensing (RS) and Geographical Information System (GIS) are properly utilized, then there are tremendous scopes for severe convictive weather phenomenon management. Indore planning area in India is extremely suitable to study; based on GIS/ RS techniques, which has proved the results of urban development. Mostly the methodologies are based on alternate planning scenarios for agricultural, climate change, transportation and air quality trend analysis. Air temperature is the main property of climate change and the most easily measured geographical consistent indicator. Atmospheric warming and climate change may affect physical processes including ice on rivers, lakes, proportion of snow to total precipitation, and temperature in freshwater ecosystems.

II. PRESENTATION OF RESEARCH

Climatology of severe convection: The climatology of severe forms of deep, moist convection with brief overviews of a number of cases are presented, in part to illustrate the principles developed, but also to show the variety of synoptic-scale structures in which severe convection can develop. A discussion of planetary boundary layer processes, focusing on how these relate both to synoptic scales and to severe convection. A global climatology of severe convection is not generally available, owing to the absence of international commitment to the development of such a database. A summer's heating, the warm, moist boundary layer over the sea basin and deep-Ocean are the source of most of the region's severe convection. In the warm season, severe convection can spread well poleward of the warm sector in cyclones. An association between jet streaks and severe convection often can be found during the warm season, as well. During the early spring, intense (or intensifying) extratropical cyclones can bring moist, unstably-stratified air into their warm sectors, just as in the winter. Later in the spring, as hemispheric baroclinity weakens, the extratropical cyclones and jet streams are correspondingly less intense, but static stability may be relatively low, such that a given amount of geostrophic advection (EQN. 1) produces stronger vertical motions than in the more stable wintertime.

$$\left(\nabla^2 + \frac{f_v^2}{\sigma}\frac{\partial^2}{\partial p^2}\right)\omega = \frac{f_v}{\sigma}\frac{\partial}{\partial p}\left[V_2 \bullet \nabla\left(\frac{1}{f_v}\nabla^2\phi + f\right)\right] + \frac{1}{\sigma}\nabla^2\left[V_2 \bullet \nabla\left(-\frac{\partial\phi}{\partial p}\right)\right] \qquad (1)$$

The right lapse rate and moisture conditions can be created within a major winter storm, outbreaks of severe convection (Galway, 1979; Kocin, 1995) can occur. A conceptual model (FIG. 1) of the vertical motions and ageostrophic circulations associated with jet streaks has been developed by numerous authors (Riehl, et al. 1952; Cunningham and Keyser, 1997) and used extensively to diagnose regions of ascent. Ascent, of course, is favorable for cyclogenesis, widespread precipitation, and organized deep, moist convection.

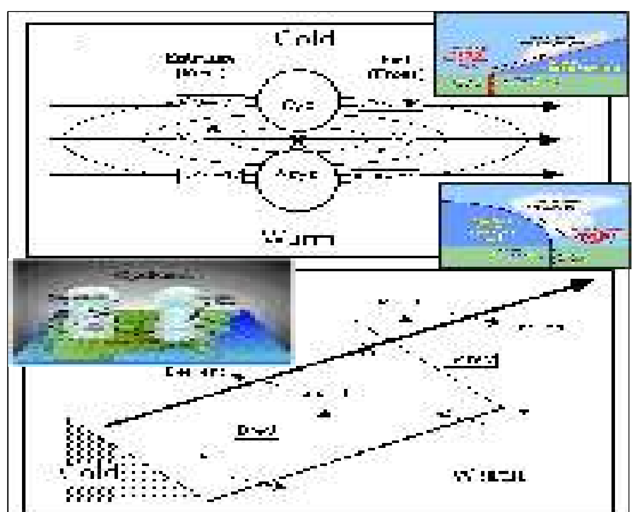
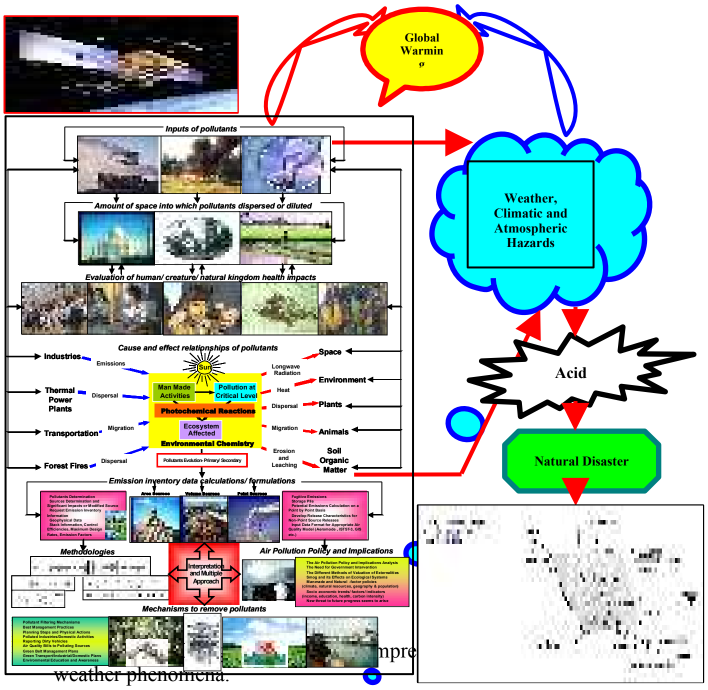


FIG. 1. A conceptual model of the vertical motions and ageostrophic circulations associated with jet streaks.

The ageostrophic wind is an essential component of the synoptic-scale; mesoscale atmospheric environments and the simplest definition of the ageostrophic wind, i.e. the portion of the real (observed) vector wind that departs from geostrophy. On the other hand GIS/RS awareness program can play a vital role on mitigation of climate change with some recommendations to integrate sustainable development program through people's participation, to promote, organize, and coordinate efforts to study not only agricultural quality production, but also pollution related activities distinguished through 3D-logical model to understand the severe convictive weather phenomena (FIG. 2).



weather phenomena.

And the correlation coefficients among velocity and "natural" ageostrophic velocity components of flights in TABLE I.

Correlation	Fall	Winter	Spring	Mean
Zonal and meridional wind…	0.258	0.135	0.288	0.211
Zonal wind and along-contour component of ageostrophic wind…	0.236	0.055	0.085	0.113
Meridional wind and cross-contour flow…	0.321	0.136	0.056	0.138
Cross-contour flow and along-contour component of ageostrophic wind…	-0.040	0.003	-0.057	-0.025
Cases...	**611**	**743**	**637**	**1991**

TABLE I: Correlation coefficients among velocity and "natural" ageostrophic velocity components of flights (Kt^2).

III. RESULTS AND CONCLUSIONS

In the study, it has been suggested that jet streaks are a feature that is associated with severe convection via their vertical motions and coupled ageostrophic flows. Major cool season cyclogenesis events involving severe convection seem to show a preference for poleward jet exit regions (Uccellini, 1990). In the warm season, severe convection can spread well poleward of the warm sector in cyclones. An association between jet streaks and severe convection often can be found during the warm season, as well. Thus, moisture can be the major limiting factor on severe convection during the spring and fall, when extratropical cyclones brush across the poleward half of the continent. Severe convection in major outbreak situations during the climatological frequency maxima for severe convection (Miller, 1972; Doswell, 1993) is relatively easy to forecast/ nowcast and understand the social, economical, cultural aspects of severe storms.

IV. AKNOWLEDGMENTS

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