Numerical Model – Contd.

Write about MONEX first – Its experiments

Another experiment began with conditions that prevailed over the earth in ice Age about 18000 years before present. This was done by the help of changes in the orbital character of the earth. The experiment suggested that a weaker summer monsoon circulation prevailed in the ice age than at present. This was primarily caused by increased reflectivity of ice sheets over South Asia than by colder sea in ice age.

Predictability of monsoons was yet another topic on which models were built. It was shown by numerical simulation that the variability of average pressure and rain of July due to short period instabilities occurring in the absence of a boundary anomalies can account for most observed variability at mid latitudes but not at low latitudes. On this basis of evidence, it was suggested that a large part of low latitude variability due to boundary anomalies in sea surface temperature, albedo & soil moisture. Additional variability was due to long time natural fluctuations. J. G. Charney, J. Shukla & Rowntree (1972, 1976) worked on this aspect.

GCM was applied to the study of summer & winter monsoon patterns over East Africa, South Asia & oceans. Work was done by Murakami et al, Godbole, Abott, Alyea & Gilchrist. Physical processes were incorporated in the GCMs were solar & infrared radiation, cloudiness, latent heat release due to small & large scale ppt., subgrid scale transports of momentum, moisture & sensible heat

GCM simulations of large-scale features of Indian monsoon like reversal of heating pattern, wind pattern were done by Hahn & Manabe, Ramage & Raman. Gilchrist worked on ppt. patterns.

Numerical sensitivity experiments were also imp. Hahn & Manabe worked on effect of mts., Alyea, Saltzman, Vernekar on Ice age simulations, Manabe, ~~Sadler~~, Sadler, Harris, Findlater on ~~Seasonal~~ ~~Of pressure~~ simulation of winter monsoon,

The Asian summer monsoon was also simulated by an 11-layer general circulation model. Gilchrist described simulation by a 5 ~~type~~ layer GCM in which diabatic heat sources & sinks were considered. An 11 layer model developed by the Meteorological Office simulated over-all large scale features, explained primary monsoon circulation, but not smaller scale features like Bay depressions & cyclones.

Monsoonal subtropical quasi-stationary large-scale motion system was examined using results from real data medium range prediction experiment. Analyses of structure & barotropic & baroclinic energetics in wave no. domain were performed & contrasted with climatological observation studies. Mechanisms of wave maintenance & roles of each wave were studied by Gilchrist, Manabe, Stone, Daggupaty, Krishnamurty & Kanamitsu. Baroclinic & barotropic energetics of waves were computed. Available & energetics of

of these waves are generated by moist convective heating. Wave 1 transports sensible heat up the temp. gradient & increases zonal available potential energy. Both waves convert potential energy to kinetic energy in thermally direct E-W circulations.

A model of seasonally varying planetary scale monsoon was formulated by Webster. It was used to test hypotheses that the mean & transient structure of the monsoon system to solar declination are primarily functions of differential heating of land & sea.

Modelling was also done by P.K. Das & H.S. Bedi. A regional primitive equation model is used to simulate the monsoon trough. The model has 3 layers & a boundary layer adjacent to the earth's surface.

Another model on monsoonal mid tropospheric cyclogenesis over Western India was done by R.W. Brode and M.K. Mak. Summer radiosonde data collected during the International Indian Ocean Experiment was used to determine the observed basic state prior to the development of intense mid-tropospheric cyclone over the west coast. The results suggest that the initial development of the cyclone might occur most prominently at a lower mid tropospheric level and in a later stage the level of maximum intensity might rise to midtroposp-heric level due to moist convection and accompanying

vorticity transport by clouds.

Stability of monsoon zonal flow has been studied by Shukla and Kesavamurty etal who found that monsoon atmosphere is not baroclinically unstable and the CISK mechanism can lead to growth of disturbances on the same scale as observed monsoon disturbances. Kesavamurty found that monsoon zonal flow is barotropically unstable in lower and midtroposphere and this instability can yield disturbances of reasonable growth rate and scale.

Model on growth of monsoon disturbances over Western India was developed by B.N. Goswami, Satyan & R.N. Kesavamurty.

Topographic Rossby waves induced in a westerly flow over orography in summer monsoon were investigated using a quasi-geostrophic β-plane model by Sulochona Gadgil.

A numerical study of surface cooling processes during summer in Arabian Sea was done by M.D. Cox.

A laboratory modelling of oceanic response to monsoonal winds was done by Ruby Krishnamurty.