Letter to the Editor

551·594·6 : 551 : 551·515·8(267)

USE OF RADON MEASUREMENTS TO IDENTIFY AIR MASSES OVER THE INDIAN SEAS DURING THE SOUTHWEST MONSOON SEASON

In a letter published by Rama (1966) in this journal, proposal for radiometric studies of Indian summer monsoons had been discussed. It is argued "it seems possible to decide from radon measurements whether the summer monsoons arise mainly from the Arabian Sea or involve a major influx of air and water vapour from the Indian Ocean south of the equator. If the current is mainly westerly, the low level air should be coming from the north African continent and consequently should be rich in radon. On the other hand if it originates in the southern hemisphere, it should be very poor in radon both because of lower input (since land area is small) and long period of traverse over the ocean which should result in almost complete decay of radon."

It is reported by Rama in *Science Today* (October 1966) that during the southwest monsoon season of 1966, observations were taken aboard the ship, *State of Bombay*, which was cruising between Bombay and East Africa across the equator. The experiments were carried out in two operations, one in the second week of July when there was a break in the monsoon rains and the other in the fourth week of the month when the monsoon was quite active. Both the experiments showed, according to Rama, essentially similar results; radon-poor air was observed both south and north of the equator, but only upto a few degrees north, and radon-rich air during most of the traverse over the Arabian Sea. The division between radon-poor and radon-rich air was at about 5°N and was found to be fairly sharp. From these results Rama has concluded that the radon-poor southeast trades cross the equator but intrude only a little into the Arabian Sea, the intrusion being rather insignificant; the rest of the Arabian Sea was invaded by radon-rich air coming from Arabia and north African continent.

As the use of radon results in identifying air masses is very important from the point of forecasting, it is proposed to give below remarks regarding the various points mentioned by Rama :

(*a*) Radon-rich air over the Arabian Sea both during break and active monsoon would only show that radon results cannot be utilised for getting idea about air masses.

(*b*) Westerly air over the Arabian Sea need not always be from Arabia and northeast Africa. In order to be sure of this, one has to trace the trajectory of the westerly air backwards to its source region.

(*c*) If the deflected trades are not present in the lower levels, the air from Arabia being warm, an inversion will develop right from the surface as soon as the air begins to travel over colder sea. The development of the inversion will prevent transport of significant amounts of moisture upwards from the colder sea surface. The inversion during the monsoon season over the Arabian Sea as shown by the IIOE results, occurs only above about 900 mb and not from the surface. The deflected trades are cold and have near dry adiabatic lapse in the surface layers. As such, they will be able to pick up moisture from the Arabian Sea surface and the same can also be transported at last upto the inversion base while moving north or northeastwards towards warmer latitudes.

The Arabian air being warm will flow above the cold deflected trades to the east of the Somalia and Arabian coasts, the boundary between the two air masses sloping eastwards with height. As such, ordinarily there will not be air from Arabia side in the low levels over the Arabian Sea during the months June to September when the monsoon is active or strong as judged from rainfall on the west coast.

In view of the above, it can be stated that radon measurements cannot be used to identify air masses during the southwest monsoon season.

Air over the Arabian Sea upto about 10°N in the lower levels in May is from Arabia and we do not, therefore, get any rainfall on the coast in contrast to the monsoon months when there are deflected trades in those levels.

Further, the presence of moist air alone is also not sufficient to get rain over the west coast. There must be a suitable mechanism for the formation of rain.

Rama has stated in his article in *Science Today* "On either side of the equator there exist narrow belts of steady winds called Trade Winds. They blow from the northeast in the northern hemisphere

and from the southeast in the southern hemisphere. The equator normally acts as a barrier to their crossing from one hemisphere to the other." As we well know, the trades are not in narrow belts and the equator does not act as a barrier to the passage of air across it from one hemisphere to the other. Crossing of the equator causes a change in the direction — the southeast trades become southwesterly to westerly winds in the northern hemisphere and the northeast trades become northwesterly to westerly winds in the southern hemisphere; these trade winds on crossing the equator into the other hemisphere or the deflected trades as they are called, get in the air circulations in the respective hemisphere.

The IIOE results have definitely shown that there are deflected trades in the lower levels over the Arabian Sea during active or strong monsoon on the west coast. There is only a difference amongs meteorologists about the mechanism responsible for increase in the depth of moist current from about 1·5 km to the west of about 68°E to about 6·0 km over the west coast and the Peninsula. In this connection a reference might be made to the papers of Desai (1966).

Large radon values over the Arabian Sea both during break and active monsoon conditions would incline one to the view that radon might be escaping into air from the sea floor across water as from the soil and surface rocks of the continents. The causes of the radon values suddenly changing near about 5°N, being very high to the north and low to the south, are not clear; information regarding the chemistry of sea floor might throw light on the point.

B. N. DESAI

173, Swami Vivekananda Road,
Vile Parle (West), Bombay
January 27, 1967

REFERENCES

Desai, B. N. 1966 *Indian J. Met. Geophys.*, **17**, pp. 399-400, 559-562 and 573-580.

Rama 1966(a) *Ibid.*, **17**, pp. 651-652.

1966(b) *Science Today*, A Times of India (Bombay) publication, 1, pp. 21-23.