Table 1. Experimental annual forecasts for 1997 and 1998 from ensemble forecasts

Configuration	Iteration in 1000	Forecast rainfall in mm 1997	1998
A	5	860	946
	10	862	949
	15	861	947
	20	860	944
	25	863	942
	30	864	943
	35	863	945
Mean (mm)		862	945
Standard deviation (mm)		1.5	2.8
B	5	863	946
	10	865	949
	15	859	948
	20	860	941
	25	863	943
	30	866	945
	35	864	939
Mean (mm)		863	944
Standard deviation (mm)		2.4	3.4
C	5	860	944
	10	863	940
	15	864	945
	20	865	949
	25	865	946
	30	866	943
	35	865	948
Mean (mm)		864	945
Standard deviation (mm)		1.9	2.8
Final mean (mm)		863	945
Final standard deviation (mm)		2.1	2.8

number of forecasts for each year by varying the number of iterations. The network configuration, as well as other network parameters were identical to those used for statistical evaluation of the network for 73 hindcasts. The range of iteration itself was determined as that which provided the best result (minimum absolute error) in case of the 73 hindcasts. For clarity of presentation and to indicate the dispersion (standard deviation) of the forecast with the number of iterations, we present in Table 1 the mean and the standard deviation of the ensemble forecast, for three network configurations. The experimental forecasts quoted here are the final mean of all these ensemble forecasts. The (mean) standard deviation of the forecasts thus provides a measure of precision of our forecasts.

Once again we want to emphasize that this forecast is a purely experimental one, to provide an objective evaluation of the forecast skill of our method; it is thus not meant for any operational use. A general weakness of the method is that it often fails to capture very large (more than twice the standard deviation) departures from the mean, a weakness shared by most statistical methods. It should be noted that 1997 is also predicted to have a normal monsoon, which will be the tenth consecutive normal monsoon. In contrast, 1998 is predicted to have an excess monsoon. It will be interesting to check next year how our forecast compares with observations.

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Temporal variation in gravity field during solar eclipse on 24 October 1995

Solar eclipses provide an unique opportunity for the study of celestial phenomena such as different parts of the sun like corona and chromosphere, its atmosphere and their interaction with the earth and its atmosphere. The solar eclipse on 24 October 1995 starting from sunrise at Iran and ending at sunset at the Pacific Ocean provided a 46 km wide strip for approximately 1800 km in India from Neem Ka Thana (Western Rajasthan) to Diamond Harbour (West Bengal) where total solar eclipse was observed for some time between 7.22 am to 10.30 am (ref. 1). This solar eclipse was unique in several ways due to social consciousness and several scientific experiments were conducted which provided several interesting results[2].

During this period of solar eclipse, we happened to be at Dhoraji (21°44′; 70°27′;

Saurashtra) in connection with the gravity survey for oil exploration in that region. This region falls in approximately 80% of the total eclipse and we recorded the temporal variation in the gravity field at this place continuously for approximately 12 h before and after the eclipse. The variation in the gravity field is recorded using a Lacoste–Romberg gravimeter of 0.01 μgal accuracy. The temporal variation in the gravity field recorded at a station can be broadly classified as: (1) Very large period (10^2–10^4 years) variations related to the mantle processes, sea level changes, glacial rebound and ice processes. (2) Large period (10–10^2 years) variations due to core–mantle interaction, plate boundary deformation, etc. (3) Medium period (days to years) variations due to earthquakes, volcanoes, etc. (4) Short period (hours to days) variations caused by drift of the gravimeter, ocean tides. (5) Shorter period (hours) variations due to the sudden changes in the atmosphere such as pressure and temperature. (6) Shortest period (seconds to minutes) high frequency noises which are sharp and sudden.

As mentioned above, these variations are largely characterized by their wavelength which is used to classify them in different groups. In the 12-hour record which we made, we can neither record nor identify the variations classified under groups (1), (2) and (3). The fourth group of variations show a cycle of 24 h and is represented by smooth cyclic changes as given in Figure 1 which represents the tidal variation on 24 October 1995 at Dhoraji. It is the group (5) kind of variations which can be recorded in our gravimeter and are of present interest. The variations under group (6) are easily identifiable as they are sharp changes due to sudden jerk or some motion in the vicinity. Some experiments of recording gravitational field during solar eclipse[3,4] were conducted previously to find out the tidal effects during that period and gravitational shielding (Majoranna effect).

The recorded variation of the gravity field and the tidal (Figure 1) corrected field on 24 October 1995 for a period from 5.00 am to 11.00 am are shown in Figure 2. Both the graphs show a smooth variation due to short period features like tidal and the drift of the gravimeter over which a shorter period feature of 10–12 μgal between 6.30 and 7.30 am is superimposed. This variation can neither be classified under short period variations due to tidal effect or drift of the gravimeter nor under high frequency noise which have special patterns. Therefore, this variation is highly significant as it occurs with the onset of solar eclipse. It may represent sudden changes in the earth's atmosphere with the onset of eclipse. Exact nature of the changes in atmosphere is difficult to visualize. However, it could be due to decrease in the different kinds of radiations such as gamma rays, X-rays and radio intensity which are found to decrease with the onset of eclipse or simply due to changes in the atmospheric pressure. Therefore to understand its actual nature and mechanism, more planned experiments of this kind should be carried out during solar eclipses throughout the world whenever such opportunities are available.

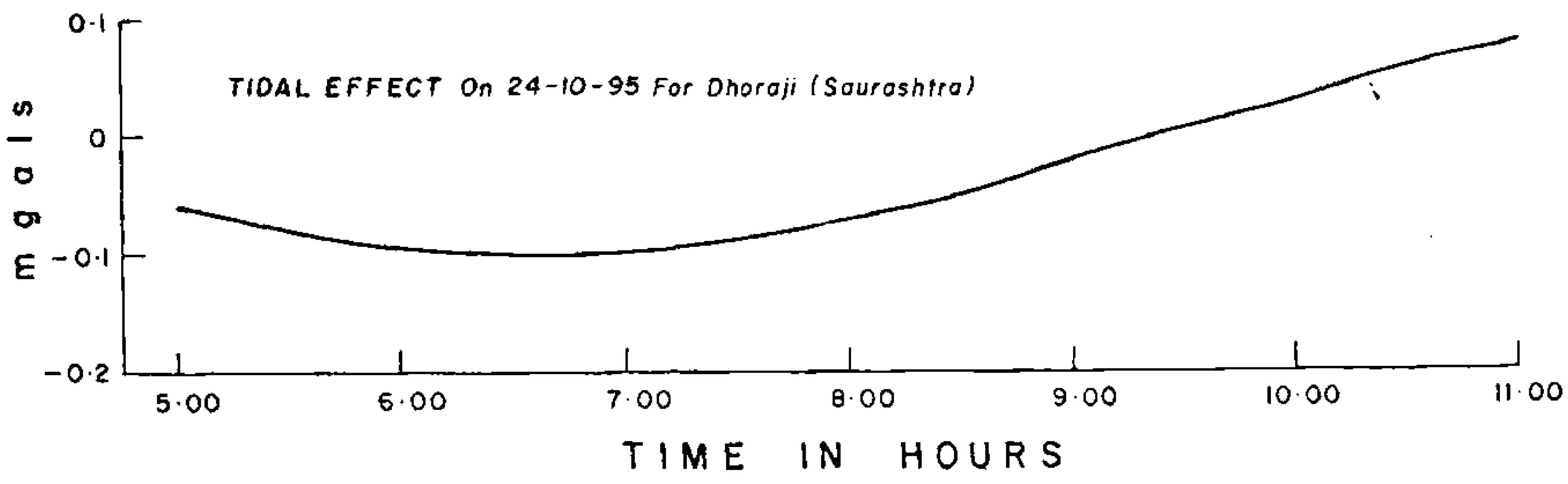

Figure 1. Tidal effect on 24 October 1995 at Dhoraji (Saurashtra).

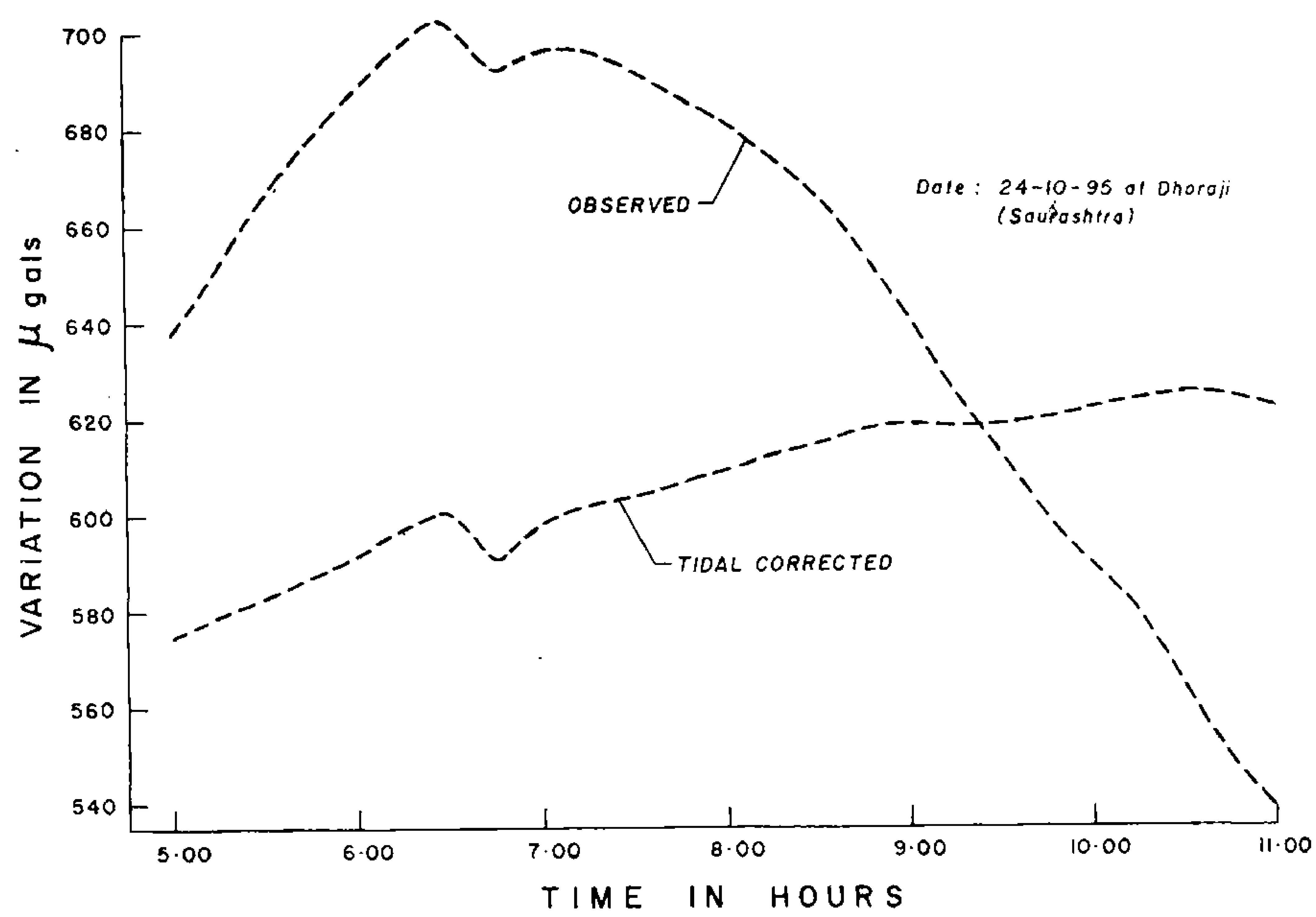

Figure 2. Observed and tidal corrected gravity field at Dhoraji on 24 October 1995.

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