

**A PRELIMINARY REPORT OF VERY LOW FREQUENCY ANOMALY IN VTX-MALDA PROPAGATION PATH BEFORE THE NEPAL-7.9M EARTHQUAKE ON 25/4/2015**

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Two types of VLF anomalies were observed from 22<sup>nd</sup> of April, 2015.

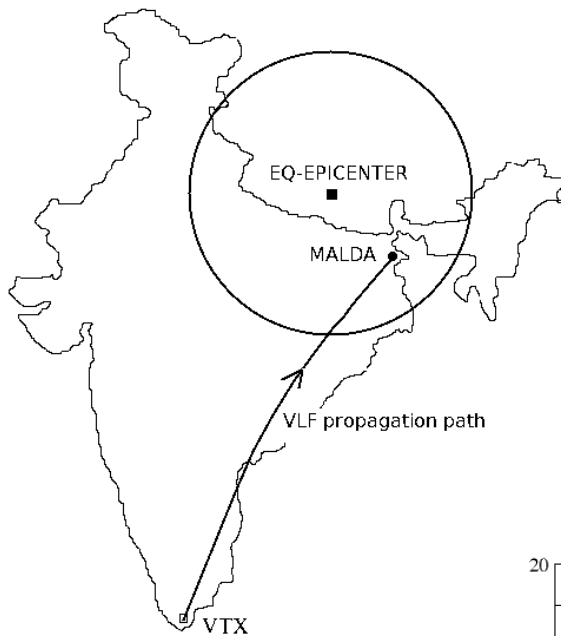
1. SUNRISE TERMINATOR SHIFTS ON 22ND APRIL, 2015 AND 25TH APRIL, 2015
2. SUNSET TERMINATION SHIFT ON 24<sup>th</sup> OF APRIL, 2015
3. NIGHT TIME FLUCTUATION and DLPT CHANGES ON 22/4/2015

Earthquake preparation zone radius :  $A(KM) = 10^{4.13M}$  where,  $M=7.9$   
 $=2500$  km

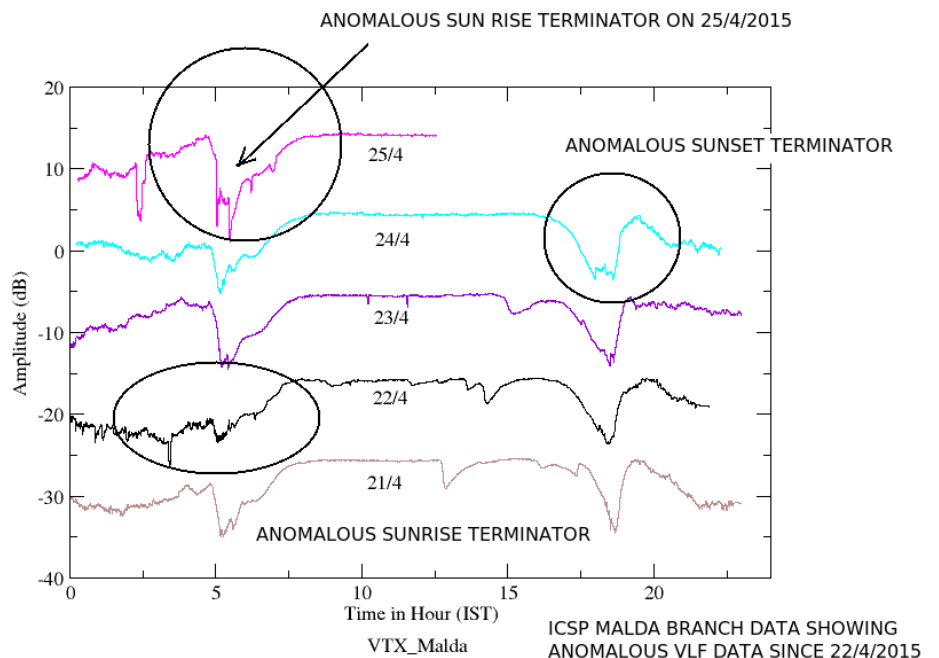
Fig. 1 shows half the size of the preparation zone which overlaps with the propagation path from VTX transmitter to MALDA receiver. Indeed, the whole preparation zone would overlap with the entire propagation path. Figure 2 shows the actual observed data in the last four days at VTX Malda Station.

This is a raw data which also includes the solar flares (not affecting our conclusions).

What is clear is that there was clear pre-cursors of this gigantic earthquake since 22<sup>nd</sup> of April, 2015. This is being reported in a separate paper (in preparation).



**FIG. 1: SHOWS THE EARTHQUAKE VIS-A-VIS THE PROPAGATION PATH OF VLF**



ICSP MALDA BRANCH DATA SHOWING ANOMALOUS VLF DATA SINCE 22/4/2015

FIG. 2 ABOVE SHOWS THE ACTUAL DATA. ANOMALOUS DATA IS ENCIRCLED.

Update on 26<sup>th</sup> April, 2015

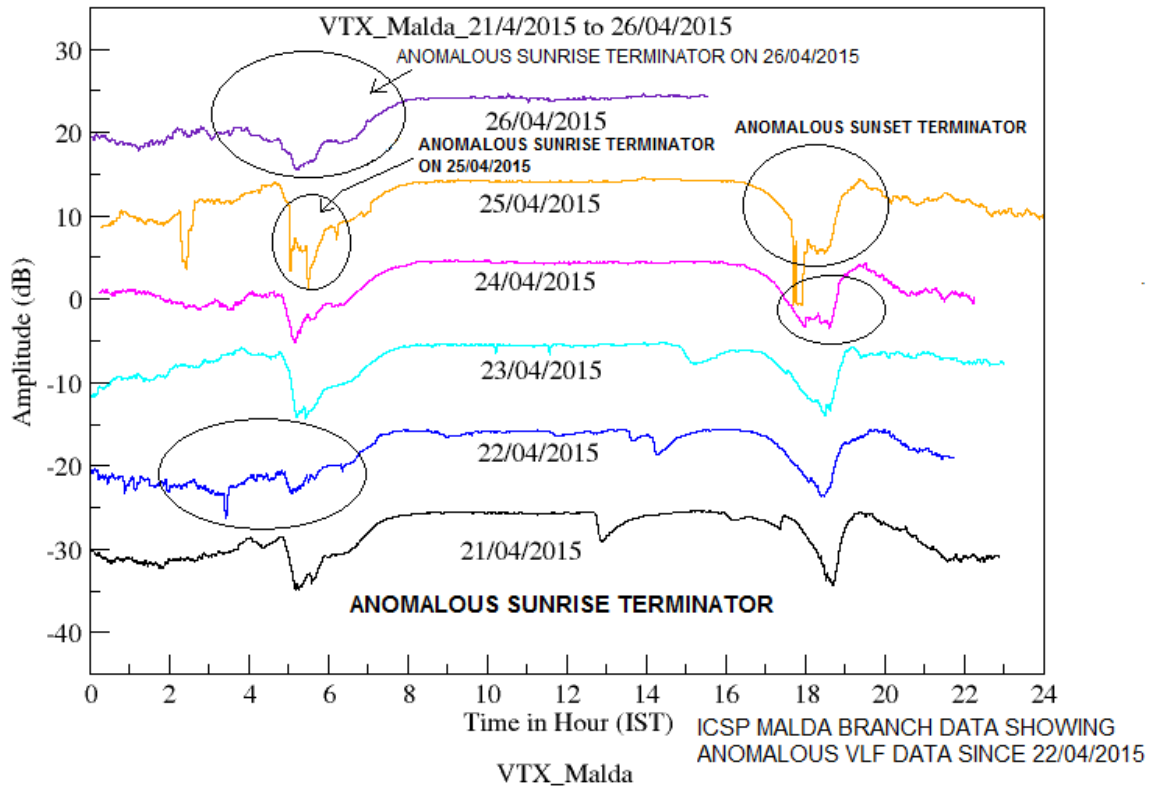


FIG. 3: Showing update of the result. Notice that the Sunrise terminator is abnormal on 26<sup>th</sup> April, 2015.

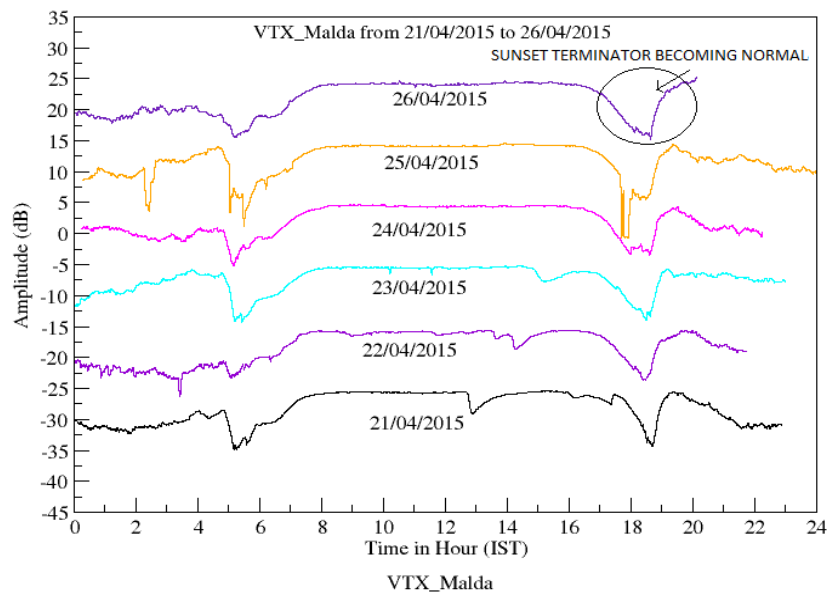


FIG. 4: We see Sunset terminator becoming normal. So alert remains on effect till next 60 hours from 6PM of 26/04/2015

Update on 27th April, 2015 12noon

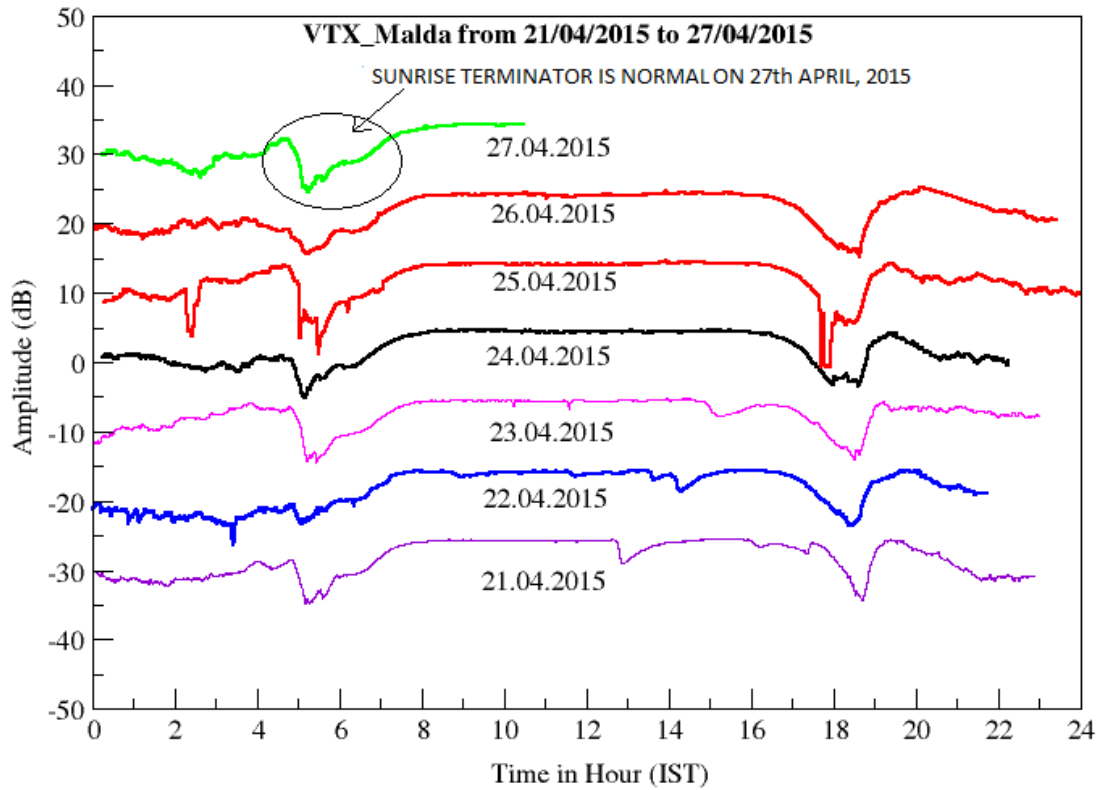


FIG. 5: The VLF data till noon of 27th April, 2015. The sunrise terminator is normal and indicates that the perturbation is sub-siding. However, alert is on for 48 hours since 6am of 27th April, 2015.

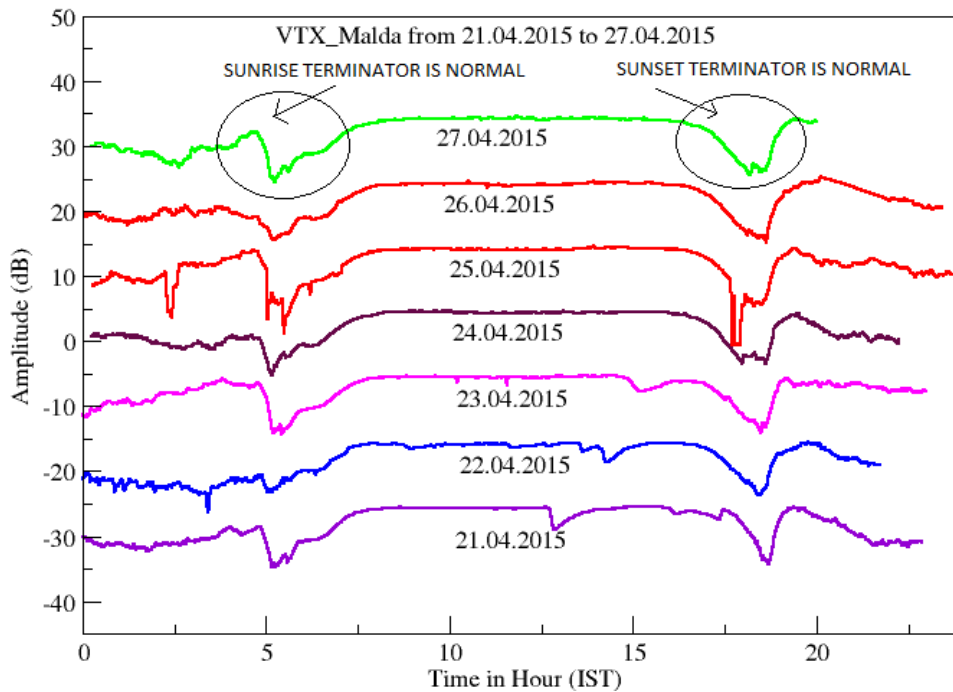


FIG. 6: Data clearly shows normal signal on 27<sup>th</sup> April. The alert based on 26<sup>th</sup> April, 2015 remains valid till Wednesday morning

Update on 28<sup>th</sup> April, Morning:

VLF signal appears to be normal since Sunday morning. The alert remains valid till Wednesday morning.

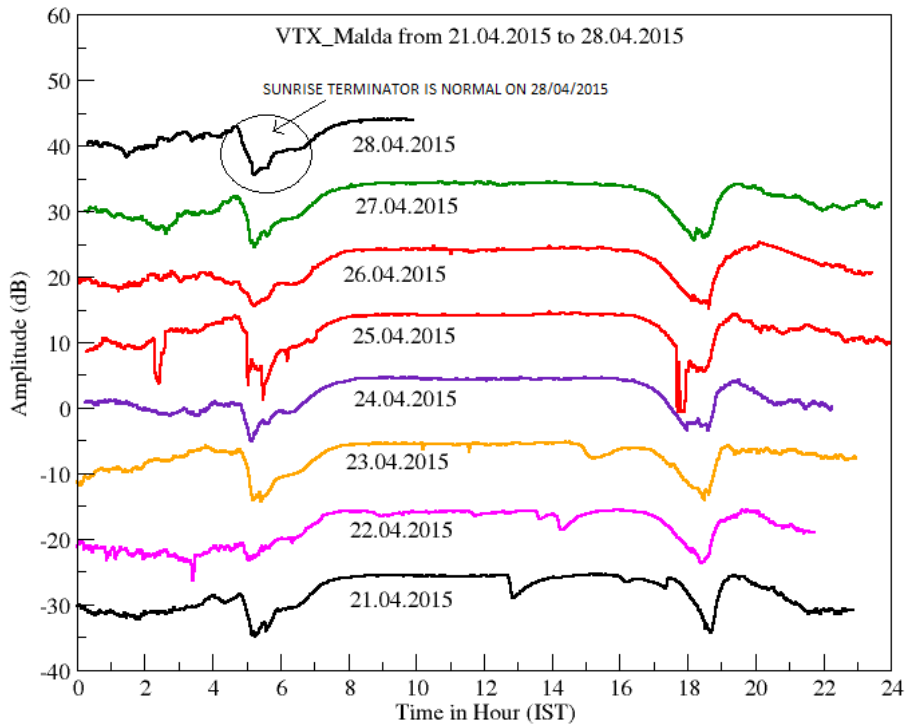


FIG. 7: The morning terminator showing normal behaviour on 28th April, 2015.

Update on 29<sup>th</sup> April, Morning:

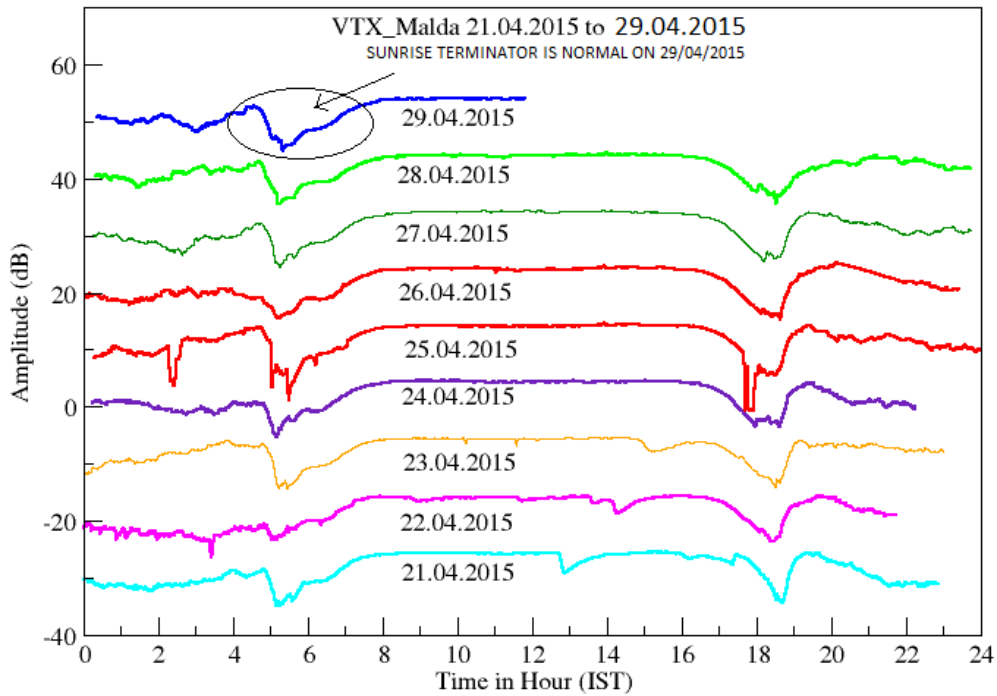


FIG. 8: The data is normal over last 36 hours, indicating waning of the VLF activities around earthquake preparation zone.

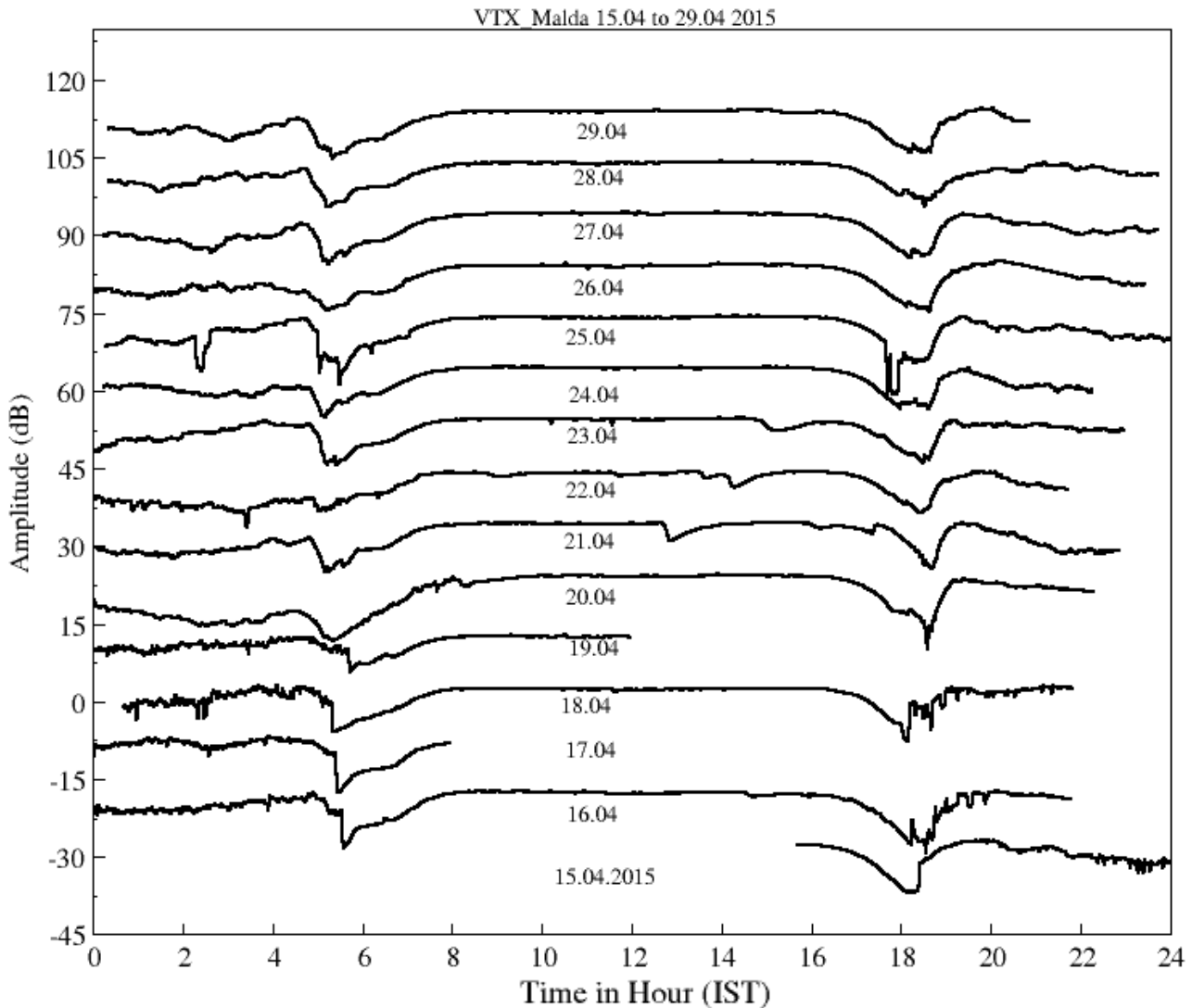


FIG. 9: 15 day data of VTX-Malda propagation path clearly showing anomalies beginning 19th of April and becoming extremely anomalous on the 22nd. Data since 26th afternoon is totally normal

According to earlier experiences reported in:

Sasmal, S. & Chakrabarti, S.K.: Unusual behavior of Very Low Frequency signal during the earthquake at Honshu/Japan on 11 March, 2011, 2014, InJP, 88, 1013

Ray, S.; Chakrabarti, S. K.: A study of the behavior of the terminator time shifts using multiple VLF propagation paths during the Pakistan earthquake ( $M = 7.2$ ) of 18 January 2011, 2013, NHESS, 13, 1501R

Ray, S.; Chakrabarti, S. K.; Sasmal, S.: Precursory effects in the nighttime VLF signal amplitude for the 18th January, 2011 Pakistan earthquake, 2012, InJPh, 86, 85R

Ray, S.; Chakrabarti, S. K.; Mondal, S. K.; Sasmal, S.: Ionospheric anomaly due to seismic activities-III: correlation between night time VLF amplitude fluctuations and effective magnitudes of earthquakes in Indian sub-continent, 2011, NHESS, 11, 2699R

Sasmal, S.; Chakrabarti, S. K.: Ionospheric anomaly due to seismic activities - Part 1: Calibration of the VLF signal of VTX 18.2 KHz station from Kolkata and deviation during seismic events, 2009, NHESS, 9, 1403S

Chakrabarti, S. K.; Sasmal, S.; Chakrabarti, S.: Ionospheric anomaly due to seismic activities - Part 2: Evidence from D-layer preparation and disappearance times, 2010, NHESS, 10, 1751C

papers, Precursors can come 72 hours before the actual earthquake. We find that the last anomalous data was on 26<sup>th</sup> April, 2015 at the sunrise terminator. So the Next 72 hours from 26<sup>th</sup> April, 2015 6am is crucial also.

The first earthquake on 25<sup>th</sup> April was about 72 hours after 22<sup>nd</sup> April, 2015 anomaly. We expect more earthquakes within 72 hours from 6am of 26<sup>th</sup> April, 2015.

NOTE: The anomalous data of 25<sup>th</sup> April could be precursors of the aftershock 6.7M on 26<sup>th</sup> April 2015.

PLEASE WATCH THIS SPACE FOR MORE UPDATE. READ THE PAPER BY THIS GROUP ON VLF EFFECTS ON SEISMIC ACTIVITIES.

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