Ensemble Earthquake Forecast Test in North-East Tibet Plateau with Multiple Models

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There are many earthquake forecast models based on seismicity analysis, some are seismic pictorial diagram analysis such as seismic belt, seismic gap; Some are statistic models or algorithms such as Pattern Informatics (PI), Region-Time-Length (RTL), State Vector (SV); Some are physical related model such as Load-Unload-Response-Ratio(LURR), Coulomb Failure Stress Change. There are also some earthquake forecast methods based on geophysical observatory data, such as earthquake related anomaly detection of gravity, crust deformation, earth resistivity, electrical and magnetic signals, ground water level, ground water temperature, ground water radon, etc. In recent years, remote sense data and ionosphere data observed by satellites have been applied to earthquake forecast exploration.

Although none of the above models could solve the problem of earthquake prediction, we can make use of the merits and avoid the shortcomings of each model. For example, PI model could detect the potential earthquake locations with high probability during several to ten year period, but it is unable to tell the precision of month scale forecast, so it could be used for location forecast. SV model could detect the short term state change of the whole selected seismic region, but it could not tell the potential earthquake location.

In this paper, we established a hierarchical earthquake forecast system by choosing different forecast model for different factor of earthquake according to the case study results. For earthquake location forecast, seismic belt, seismic gap detected by seismic pictorial diagram analysis, seismic hot spots by PI model, region with descending change of earth resistivity, region with anomalous remote sense radiation are chosen as the forecast models. For earthquake time forecast, the geomagnetic anomaly, anomalous electrical and magnetic signals, anomalous remote sense radiation, anomalous ionosphere disturbance are chosen as the forecast models, and the probability of . For earthquake magnitude forecast, the magnitude of the target earthquake is about two larger than the previous seismic scale or size of the swarm or seismic belt.

The North-East Tibet Plateau (33° ～42° N，93° ～107° E) was chosen as a test region for our hierarchical earthquake forecast system. All of the chosen forecast models are applied to this region from January, 2009 to June, 2010. The results show that the effects of comprehensive forecast of the location, magnitude and time of the forth coming earthquake in this region outperform any of the single models.