

11 Mar 2011
Tohoku EQ

4–10 Jan 2011
Magnetic field
disturbance (&
SES activity)

Magnetic (&
electric) field

NT analysis
of seismicity.
Variability β

22 Dec 2010
 ΔS is minimized.
Increase in Λ_i & β

5 Jan 2011
deepest β_{\min}

DFA of EQ
magnitudes.
Exponent α

22 Dec 2010
 $\alpha_{\min, \text{bef}} < 0.5$
 ≈ 0.35

5 Jan 2011
 $\alpha_{\text{cor}} > 0.5$

13 Jan 2011
 $\alpha \approx 0.5$
(random)

23 Jan 2011
 $\alpha_{\min, \text{aft}} < 0.5$
 ≈ 0.42

Residual GPS data.
Surface
displacements

Gradual
mitigation
of the crust
uplift

12–22 Dec 2010
Random
orientations of
GPS azimuths.

22 Dec 2010
Start of gradual
alignment of orientations
of GPS azimuths toward
the southern direction
and gradual crust uplift.

5 Jan 2011
Full alignment of
orientations of GPS
azimuths
southwards, thus
agreeing with the
strike of the
rupture fault.
Maximum crust
uplift.
Deepest β_{\min}
Establishment of
long-range
correlation
between
earthquake
magnitudes.

13 Jan 2011
The aligned
orientations
of GPS
azimuths
became
random.

23 Jan 2011
The orientations of the
displacements are re-
aligned toward the
western direction (i.e.,
consistent with the angle
 $\sim 115^\circ$ of the maximum
horizontal compressive
stress) except for an area
($142^\circ \text{ E}, 42^\circ \text{ N}$) $\sim 75 \text{ km}$ away
from the epicenter.

Minimum of the entropy change ΔS of seismicity under time reversal.
Increase in the fluctuations of the order parameter of seismicity.
Also increase of both the Tsallis entropic index q and the complexity measure of the entropy of seismicity under time reversal.
Minimum of the DFA exponent pointing to anticorrelation between earthquake magnitudes.
Anomalous groundwater changes and start of the radon concentration increase.