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Japan monster quake rattled upper atmosphere: Scientists

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The magnitude-9 earthquake that struck Japan this year not only shook the Earth, but also rattled the highest layer of the atmosphere, scientists have found.

This findings, published in the *Journal of Geophysical Research-Space Physics*, could lead to a new type of early warning system for devastating tsunamis and earthquakes, the researchers said.

Past research has revealed that the surface motions and tsunamis that earthquakes generate can also trigger waves in the atmosphere that can reach all the way to the ionosphere, one of the highest layers of the atmosphere.

Now, scientists found that the devastating Japan quake, which struck off the country's Tohoku coast on March 11, generated the largest such disturbances seen yet, creating ripples in electrically charged particles reaching nearly 220 miles (350 km) above the Earth, *LiveScience* reported.

The researchers measured these disruptions, called seismotravelling ionospheric disturbances, using about 1,000 global positioning system (GPS) receivers in Japan and Taiwan.

Disruptions of the electrically charged particles in the ionosphere would lead to anomalies in radio signals between the ground receivers and the GPS satellites, data that scientists can measure.

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The scientists detected a disc-shaped rise in electron density in the ionosphere about seven minutes after the quake. Concentric waves of fluctuating electron density then flowed out in the ionosphere from this disk at speeds of about 450 to 500 mph (720 to 800 kph).

All in all, this disruption was about three times greater than the next largest one ever seen, which came after the 2004 magnitude 9.3 Sumatra earthquake, the researchers said.

The ripples that flowed from the initial disc-shaped disturbance in the ionosphere appear to be linked to the tsunami, a connection that has the potential to save lives, the researchers said.

"This signature in space that we can see with GPS could provide early warning that a tsunami is coming," researcher Jann-Yenq 'Tiger' Liu, an atmospheric scientist at Taiwan's National Central University, was quoted as saying.

One important question in determining how much of a warning his phenomenon might provide is: "Is there any detectable precursor in the status of the ionosphere before this disturbance is actually observed?" said atmospheric physicist Gaopeng Lu at Duke University, who did not take part in this study.

"In that way, we might be able to predict the occurrence of earthquakes."

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