Can big earthquakes disrupt world weather?

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(PhysOrg.com) -- The eruption of the Laki volcano in Iceland in 1783-84 set off a cascade of catastrophe, spewing sulfuric clouds into Europe and eventually around the world. Poisonous mists and a resulting famine from loss of crops and livestock killed thousands in Iceland, up to a quarter of the population. An estimated 23,000 people in Britain died from inhaling toxic fumes. Acid rain, heat, cold, drought and floods have been attributed to the eruption, which lasted from June until February.

The recent earthquake in Japan shifted the earth's axis by half a foot. You may be wondering if that's enough to change earth's weather. No, not really, says Jerry McManus, a climate scientist at Columbia's Lamont-Doherty Earth Observatory.

Earthquakes unleash a tremendous amount of energy, but not enough to upset the energy balance of earth's atmosphere and oceans, which drive weather patterns in the short term, he says. Larger shifts of the planet's rotational axis happen each year due to the fluctuating mass of earth's atmosphere and oceans without changing the weather. These natural variations can push earth's axis up to 39 inches, far more than the Japan earthquake's 6.5-inch nudge or the 2010 Chile earthquake's 2.8-inch shift.

Those shifts are tiny compared to long-term, cyclical shifts in earth's movement that can raise or lower the planet's thermostat. The planet currently leans at a 23.5 degree angle as it circles the sun, causing winter at one end of the globe and summer at the other, as its orientation toward the sun redistributes the amount of sunlight falling on each hemisphere annually. But the seasons can be greatly intensified depending on variations in earth's tilt over long timescales. Every 41,000 years or so, earth's tilt shifts about a degree in each direction—the equivalent of nearly 70 miles. At its highest tilt—24.5 degrees—more sunlight falls on the poles; at its lowest—22.1 degrees—more light falls on the equator.

Two other astronomical cycles shape earth's climate: the changing shape of its elliptical path around the sun every 100,000 years or so, and the shifting wobble of its axis—much like a spinning top—on average, every 21,000 years. All three cycles are caused by the gravitational tug of the moon and the planets in our solar system.

In the first half of the 20th century, Serbian mathematician Milutin Milankovitch painstakingly calculated how all three cycles—respectively

referred to as obliquity, eccentricity and precession influence the amount of seasonal sunlight falling over the planet. Though the calculations that were his life's work can now be made in a few minutes by a student using a laptop, the name "Milankovitch" still describes the cycles that are so fundamental to earth's climate.

Provided by Columbia University