Differential inertia of lower and upper parts of a skyscraper drives swaying of a building

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Abstract

The lower part of a skyscraper possesses enormous weight giving the gravity of the total building, whereas the upper part is smaller in mass. Upon a gust of wind or other factors, the lower part accelerates and decelerates more slowly than the upper part, and then the upper part moves backwards first and then forwards. It resembles a traveling bus, the standing passengers move backwards and forwards upon vehicle starting from standing-still or a sudden stop.

Keywords

differential inertia; lower and upper parts of a skyscraper; swaying; accelerates; decelerate

Shaking of skyscrapers is no stranger to city dwellers. So it is not surprising that the 1,000-foot SEG Plaza in Shenzhen, south China started to sway on one afternoon this past week. What causes such shaking for high-rise buildings across the world?

To find answers, we need to turn attention to the emerging theory of seismicity (1-18). According to Newton's Law of Inertia, larger mass accelerates and decelerates more slowly than smaller object, and smaller mass accelerates and decelerates faster than larger object (1-18). The earth self-rotates and revolves around the Sun, collectively it accounts for the northeastward drift of the Tibetan Plateau upon the impact of solar and lunar gravitational pulls (1-18). This theory also explains the swaying of Humen Bridge and other bridges (19-20).

Considering a high-rise building, the lower part is very heavy giving enormous gravity, whereas the upper part is smaller in mass. Upon a gust of wind, the lower part accelerates and decelerates more slowly than the upper part, and immediately after the upper part moves backwards first, and then forwards. It is like a traveling bus, the standing passengers move backwards and forwards upon starting or abrupt stop.

Conflict of interest

None declared.

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