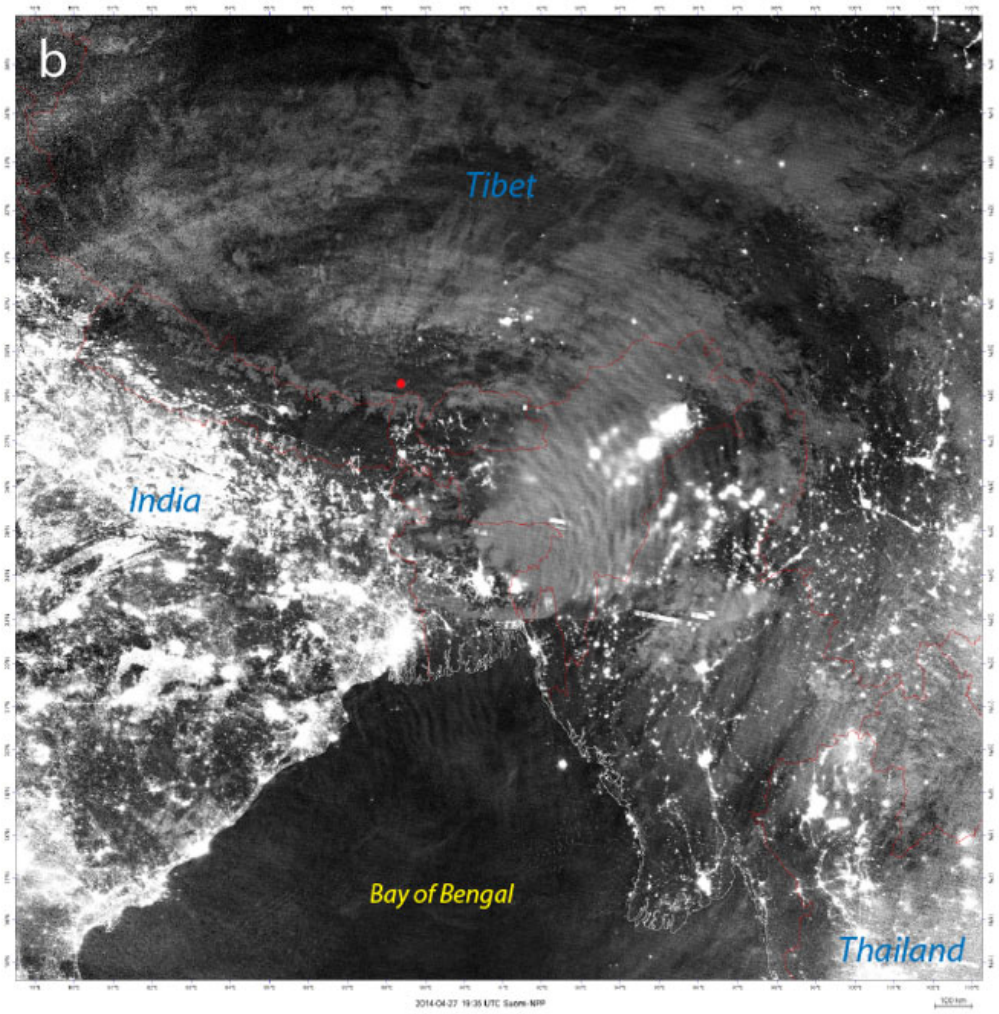
Researchers conduct gravity waves study with satellite 'nightglow' observations

November 17 2015, by Matthew Rogers


a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Tibet
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Imagery from the Earth's surface (a) and from the Suomi NPP spacecraft (b) demonstrate the impact of surface topography on the upper atmosphere through the perturbation of a thin glowing layer of air 50-60 miles in altitude. Credit: Dai Jianfeng, Chonqing University; Steve Miller/CIRA and Martin Setvak/CHI

Researchers led by the Cooperative Institute for Research in the Atmosphere (CIRA) at Colorado State University have shed light on detailed properties of upper-atmospheric motions, using low-light satellite imagery from the Suomi National Polar-orbiting Partnership (Suomi NPP) mission. The research has been published online Nov. 16 in *Proceedings of the National Academy of Sciences*.

At altitudes between 50 and 60 miles (about 90 kilometers), various photochemical processes create a faint emission of light called "nightglow."

Initial discovery of light sensitivity

An initial discovery that the Day/Night Band instrument on Suomi NPP held an unexpected sensitivity to this faint light source enabled the first visible detection of clouds on moonless nights.

The researchers have since discovered that the instrument can detect signals from atmospheric gravity waves, which impact the structure of the nightglow layer itself. The imagery details these structures at a resolution of 742 meters, which is unprecedented from space-based observations.

Gravity waves are created by a variety of phenomena in the lower

atmosphere, including weather systems, tropical storms, strong thunderstorms, the flow of air over mountain ranges, and even volcanic eruptions (the first documented example of which is included in the article).

Like ripples in a pond

The wave structures, sometimes appearing as ripples reminiscent of a stone dropped into a pond, provide detailed insights on the processes that drive the circulation of the upper atmosphere. The new measurements could be significant for their ability to improve basic understanding of these processes, and potentially to improve long-term climate forecasts.

More information: S. D. Miller et al. Upper atmospheric gravity wave details revealed in nightglow satellite imagery, *Proceedings of the National Academy of Sciences* (2015). DOI: 10.1073/pnas.1508084112

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