Satellite Tree Monitoring for Volcano Prediction

Prelims *– General issues on Environmental ecology, Bio-diversity and Climate Change.*

Mains – *General Studies-III (Conservation, environmental pollution and degradation, environmental impact assessment).*

Why in news?

NASA scientists have recently stated that they can detect early signs of volcanic eruptions by observing the changing colors of leaves from trees.

- **Underground Activity** – When a volcano is preparing to erupt, rising magma releases carbon dioxide (CO_2) and sulfur dioxide (SO_2) gases.
- **Tree Response** – Trees near the volcano absorb this extra CO_2 through their roots, which acts like fertilizer.
- **Visual Change** – The extra CO_2 makes the trees healthier and greener, which can be visible from space satellites.
- **Early Detection** – Scientists can spot these color changes in satellite images before traditional warning signs appear.
- **Satellite Eyes** – NASA scientists are using satellites to look at the color of tree leaves around volcanoes. If they see the trees getting greener, it's a red flag.
- **Healthier and greener trees** – Trees absorb CO_2 through their roots. More CO_2 from the volcano means more "food" for the trees, making them grow healthier and greener.
- **Partnership** – NASA scientists have partnered with *AVUELO (Airborne Validation Unified Experiment: Land to Ocean)*, to detect early signs of volcanic eruptions by observing the changing colors of leaves from trees.

India has active volcanoes like Barren Island in Andaman & Nicobar and this technology could enhance India's disaster management capabilities.

Significance of the discovery

- **Early Warning** – This method could provide an earlier warning for volcanic eruptions than traditional methods (like seismic activity or ground deformation) for certain types of volcanoes.
- **Remote Areas** – Many volcanoes are in very remote places, making it hard for scientists to constantly monitor them on the ground. Satellites can cover huge, hard-to-reach areas.
- **Filling a Gap** – While sulfur dioxide (SO_2) from volcanoes is easier to track, CO_2 has been tricky because it mixes with other gases. This tree-based method offers a new way to detect volcanic CO_2's impact.

- **Saving Lives** – The example from the Philippines shows how an early warning based on tree changes can lead to timely evacuations and prevent casualties.

Reference

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