

volcano-sedimentary rocks have been dated as Late Maastrichtian¹⁷⁻¹⁹. On the basis of similarity between the Pondicherry and Deccan Intertrappean woods, it seems plausible that they belong to the same age.

The wood anatomy of extant *Araucaria* is hardly distinguishable from *Agathis*, another member of Araucariaceae. Thus the fossil wood detailed here should be attributed to Araucariaceae. It is not prudent to attribute *Araucarioxylon* to extant *Araucaria*. From the fossil record it is observed that Araucariaceae was widely distributed in India during the Mesozoic and shows its maximum development during the Early Cretaceous. Its extinction at the terminal Cretaceous (Maastrichtian) is an important factor to be reckoned with. Perhaps the movement of India from south to north did not provide a suitable climate for the group to continue. The volcanic episode at the terminal Cretaceous and above all the emergence of angiosperms as a virulent group could possibly have led to its near extinction in India.

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ACKNOWLEDGEMENTS. R.K.K. thanks the Department of Science and Technology, New Delhi, for funding the project. We thank Prof. C. G. K. Ramanujam, Osmania University, Hyderabad, for helpful discussions and Dr A. K. Sinha, Director, Birbal Sahni Institute of Palaeobotany, for giving encouragement.

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NEWS

ISRO satellites escape unscathed after the Leonid meteor shower

Earth passed through the meteoroid storm associated with comet 55P/Tempel-Tuttle, with peak of storm on 17 November 1998 between 1930 hr and 2040 hr UT.

The phenomenon was studied from various angles. The precautions taken by other space agencies and satellite operators were also noted. Based on these, the following strategy was finalized to protect our satellites (5 INSATs, 4 IRSs and 1 SROSS):

- Satellite controllers were put on alert at both MCF and ISTRAC. Operational teams were augmented with experts.
- Solar panels of INSAT-2B and 2C were offset by 10° to make them parallel to the Leonid storm vector.
- The redundant bus subsystems were reconfigured for the event.
- Power buses of the satellites were deparallelled, gyros were put on (to measure attitude disturbance rates, in case

of a problem) and RCS systems were configured to avoid spurious pulsing and at the same time enabling easy operations in case of a contingency.

- The payloads, transponders in the case of INSATs, and imaging payloads in case of IRSs, were put off between 1730 hr and 2300 hr UT. The disruption in service was minimal.
- Redundant systems of IRS were kept off. Retarding potential analyser payload of SROSS C2 was operated in a campaign mode to study the effect of meteoric storm in ionosphere. The data is under analysis.

The planned preparations were executed on a countdown mode. The health monitoring of the satellites was carried out continuously by the operational teams. Leonid meteoric showers did not have any perceptible effect on any of the ISRO satellites.

Post-storm observation reports have indicated that the peak had occurred earlier than predicted and the peak was spread over a longer time period. The Zenithal Hourly Rate (ZHR) reported during the time of the storm peak was much less compared to the ZHR noticed during a similar storm encounter in 1966.

All the satellites were normalized to pre-storm conditions by 0400 hr UT on 18 November. An additional alert was maintained till 20 November and there were no anomalous observations.

All satellites of ISRO are safe and the spacecraft health reported as normal after the storm. Satellite operating agencies across the world have reported no damages to their satellites. However INMARSAT had reported a minor soft temporary glitch in one of the INMARSAT-2 backup satellites following the Leonid meteoroid storm.