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Effect of a Quaternary Meteoroid Impact in Indo-China on the Surface Sedimentary Record

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Effects of meteoroid impacts on terrestrial geology primarily have been considered with respect of proximal effects near the impact location; such as cratering, fracturing and melt. However, other than the use of rare elements (iridium) as event markers and tektite chemistry for dating control, distal effects of impacts are less-well documented. Distal effects might include: fireball, air blast, heat, water vaporization, catastrophic flooding, earthquakes, ejecta fallout (tektites & dust), large quantities of N2O from shock heating of the atmosphere, release of CO_2 and sulphur aerosols causing heating or cooling of atmosphere, IR radiation causing vegetation fires, smoke and pyrotoxins, and altered native rock geochemistry. Such processes may affect the distal surface geology, degrade vegetation cover and cause extirpation of flora and fauna.
Quaternary sedimentary sections have been examined in northern and central Cambodia, in southern China and in north-east Thailand. These locality lie within the Australian strewn tektite field [U+0336] reliably dated to 0.77-0.78Ma BP [U+0336] just before the 0.80Ma BP Brunhes/Matayama reversal. The location of the primary impact crater (if any) is uncertain but a local major crater probably lies within central Laos or just offshore to the east. The described sections are considered distal from the main impact. Stratigraphic evidence indicates a temporal sequence of catastrophic stripping of alluvial-gravel surfaces followed by catastrophic redistribution of gravel (incorporating tektites), followed by deposition of atmospheric dust. Grain-size and grain-density trends, XRD, spherule distributions, luminescence profiles, tektite, and microtektite and shock quartz assay, are used to with the stratigraphic evidence to examine an hypothesis that the sections represent the distal effects of a meteorite. Additional insight is gained with respect to prior claims that large accumulations of woody debris in Thai Quaternary river terraces were due to blast and are burnt. Fossil evidence for the local extirpations of Quaternary mammals within the region might also be related to the impact event. Tektites occur at the same level as occupation horizons of Palaeolithic people such that the impact would have had direct effects on hominins.
The stratigraphy includes: erosional antidunes, blast-induced debris flow incorporating tektites, catastrophically-broken laterite pavements and mud layers with reversed magnetism. Sedimentological evidence in favour of impact includes: the presence of delicate thin translucent-tektites that must be in situ from initial fallout as reworking would destroy them, graded spherule distributions, highly-stressed quartz grains and microtektites. Grain size data, including X-ray and CT-scanning analysis, can be used to support the impact hypothesis but alone these data are not conclusive. XRD data is inconclusive. On balance the stratigraphy and sedimentology support the notion that the sediments represent the distal effects of a meteorite in the region.