

SULAGIRI, THE LARGEST METEORITE FALL IN INDIA,

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The fall: On Sept. 12, 2008, around 8:30 hrs. Local time, the Sulagiri meteorite fell in the Krishnagiri district of Tamil Nadu, India. The meteorite was fragmented at least once on the transit and led to multiple fall around a cluster of villages near Sulagiri, defining an elliptical shaped strewn field of 3 km along NW-SE direction and 1 km across. The size of the collected fragments increases from W to E. Seven pieces of the meteorite were collected, totalling ~110 kg, making Sulagiri, the largest meteorite fall so far in India. The largest fragment weighed 50 kg and made a crater of ~1.5 m on impact, on the main road.

Petrology, mineral and chemical composition: Petrological investigation by optical and electron microscopy shows that Sulagiri is composed of orthopyroxene (Opx) and olivine. Clinopyroxenes are rare and mostly occur as patches within Opx. Troilites are more frequent than Fe-Ni metal, which are present in moderate amount. Feldspar grains are frequent. Chondrules in varying shapes, sizes (200-500 μm) and textures are present, but chondrule boundaries are mostly poorly defined and often homogenized with coarse to moderately recrystallised matrix indicating highly equilibrated petrologic type. EPM studies of thin section gave average Fa content of olivine 25.4 and Fs content of Opx 21.9, which fall at the extreme end of L-chondrites. But, bulk chemical composition by wet chemistry, on a homogenized sample gave Ni = 0.72% and Co = 340 ppm, putting Sulagiri in LL class [1]. Uniform Fa content of olivine in matrix and chondrules and the poorly defined chondrule boundaries suggest the metamorphic grade as 6. The shock stage is S2.

Cosmogenic radionuclides: A 96 g piece was counted for 20 days using a 148 cm^3 , low background, high purity germanium gamma ray spectrometer located in a 10 cm thick lead shield. The specific activities of the radionuclides ²⁶Al, ⁶⁰Co, ²²Na, ⁵⁴Mn, ⁵⁷Co, ⁴⁶Sc, ⁵⁶Co and ⁵⁸Co have been calculated using ⁴⁰K as internal standard (determined against a lab standard, counted in same geometry) and have been decay corrected to the time of fall. Assuming a spherical shape, the recovered radius is ~20 cm and the pre-atmospheric radius is expected to be ~42 cm (for about ~90% mass ablation). ²⁶Al (58.5 \pm 3.1 dpm/kg) also suggests the meteoroid radius to be >40 cm [2]. The activity ratio ²²Na/²⁶Al is nearly unaffected by shielding and expected to anti-correlate with solar activity (with a phase shift) [3]. Lower value of this ratio for Sulagiri (1.17) as compared to the values of 1.4 for Innisfree (LL5, fell in Feb. 1977) and 1.6 for Alta'ameem (LL5, fell in Aug. 1977) which fell at solar minimum, suggest that minimum of solar cycle 23 has not been attained at the fall time of Sulagiri. Low activity of the thermal neutron product ⁶⁰Co (6.4 \pm 2.2dpm/kg) suggests that our samples come from a shallow depth. Noble gases, nuclear tracks and oxygen isotopic studies are in progress.

References: [1] Kellemeyn G.W. et al. (1989) *GCA* **53**, 2747-2767; [2] Leya I. et al. (2000) *MAPS* **35**, 259-286; [3] Bhandari N. et al. (1993) *GCA* **57**, 2361-2375.