temperature is >40°C (ref. 7). The positive anomalies of maximum temperature were 7–9°C on many days and even reached 10–11°C at some stations, indicating heat wave to severe heat wave conditions almost throughout the 11-day period over the coastal AP region (Figure 1). The four Rayalaseema districts and the adjacent Nellore district in the southern part of the coastal region also experienced heat wave, despite the temperature departures being below the required criteria, since the maximum temperatures in this region were >40°C, which indicates heat wave conditions for the plains[7]. Thermal stress on a person is based on ambient temperature, humidity, exposure to sunlight, wind, clothing and level of activity, as well as age, gender and state of health[8]. Ideally, assessment of heat-wave related deaths should consider all these variables as elucidated by Dash and Kjellstrom[7] in a review of various indices involving several of these variables. However, due to non-availability of such detailed data, we used temperature and relative humidity (RH) to derive the heat index (HI), or heat stress on the human body. The daily HI was above 41°C at all the stations during the period and even higher than 54°C on a number of days at many of the stations, with a maximum value of 127°C in Vizianagaram district on 24 May 2015. A HI value between 41°C and 54°C indicates 'Danger' and >54°C indicates 'Extreme Danger' in relation to the health risk of heat stroke (http://www.srh.noaa.gov/ffc/?n=hichart). Apparently, with the computed HI values in the 'extreme danger' category during most of the days in the study period, the 2015 heat wave has taken its toll in AP claiming 2677 lives. The highest number of 587 deaths occurred in Prakasam district, followed by 335 in Nellore, 315 in Guntur and 305 in Krishna district (Figure 1).

However, the overall correlation coefficient between HI and mortality is poor in all the districts, probably because the deaths might have occurred on subsequent days after the victims were subjected to heat stroke. Moreover, there is no linear relationship between HI and mortality among the districts. In the five north coastal districts where the HI values were consistently higher ranging from 54°C to as high as 127°C, the total death toll was relatively low at 762 than in the four south coastal districts where the HI values were relatively low (40–59°C; with some exceptions) but the mortality was relatively high at 1542. In the four Rayalaseema districts where the HI values were more or less similar to that of the south coastal districts, the heat-stroke deaths were much lower (373 persons) during the period. Therefore, while temperature and RH may be the key factors for estimating the intensity of the heat stress, other variables such as overexposure to the sunlight through outdoor activity, lack of awareness of the health threat of heat waves, socio-economic conditions and delayed or no medical treatment perhaps play a more important role in the human mortality to heat waves. This can be conjectured from the enormity of the death toll in Prakasam district during the May 2015 heat wave, despite the prevalence of relatively lower HI values than in several other districts. A similar situation prevailed during May 2013, as Prakasam district accounted for a maximum 242 casualties out of the total 1249 heat-wave deaths in AP (Figure 2). In fact, our compilation of data on heat-wave deaths during 2005–15 showed that the south coastal districts, Prakasam district, in particular, accounted for 1012 out of the total 5531 deaths in the state (Figure 2). Therefore, in-depth studies are necessary to understand not only the weather phenomena, but also the socio-economic and working conditions among the vulnerable sections of the people that lead to heat-wave related deaths in areas such as Prakasam district in AP.

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Meteorite fall at Komargaon, Assam, India

A single piece of meteorite weighing approximately 12 kg and dimension 10″ × 9″ × 8″ fell at Komargaon town (lat. 26°39′N; long. 93°46′E), Golaghat district, Assam, India on 13 November 2015 (12:00 h, IST). We report here eye-witness accounts and a preliminary description of the sample which includes macro- and microstructures and a tentative petrologic-chemical classification. According to local villagers, it was a bright sunny day with a clear sky. They were startled by a thunderous sound and on searching they found a burning piece of material which might have traveled the sky and finally hit the ground hard. The celestial object landed on a soft ground mainly ploughed for plantation of

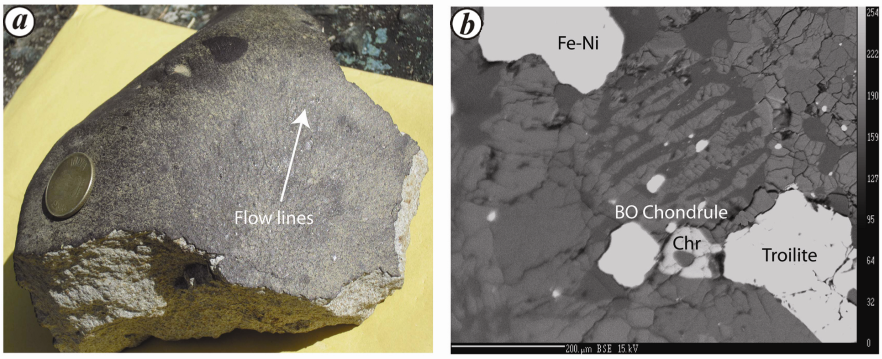

Figure 1. ***a***, Hand specimen of Komargaon meteorite with well-developed fusion crust and flow line. ***b***, Backscattered electron image of barred olivine (BO) chondrule, Fe–Ni metal, troilite and chromite (Chr).

Table 1. Records of stony meteorite fall/find in India since 1991 (compiled from the literature)

Year*	Meteorite*
12 August 1991	Didwana
30 October 1994	Lohawat and Devi Khera
20 June 1996	Piplia Kalan
13 December 1997	Vissannapeta
30 April 1999	**Sabrum**
30 May 2000	Itawa Bhopji
12 February 2001	Devgaon
2 March 2001	**Dergaon**
2001 (find)	Ararki
6 June 2002	Bhawad
27 September 2003	Kendrapara
2 November 2003	Kasauli
29 October 2004	Kaprada
17 June 2006	Bhanupratappur
21 February 2007	**Mahadevpur**
12 September 2008	Sulagiri
28 May 2009	Karimati
22 May 2012	Katol
8 July 2012	Jalangi
25 December 2012	Nathdwara
13 November 2015	**Komargaon**

*Bold indicates fall in the North East India.

mustard oil seeds. The fireball had penetrated the ground and was buried in a small hole (measuring 1.5′ in diameter and 3′ in depth). The villagers informed the nearby police station and immediately recovered the material, cleaned it and took the same into their custody. The Komargaon meteorite fall represents the fourth observed fall in North East India during the past 15 years and the 21st Indian fall/find according to the database since 1991 (Table 1).

Megascopic studies on the specimen reveal that the Komargaon meteorite resembles ordinary chondrite typically covered with different generations of fusion crusts. The youngest crust is black, relatively thin, glossy and irregular in nature due to the presence of several shallow, simple regmaglypts, marked with the divergently radiating flow lines (Figure 1 *a*). The silicate interior shows distinct integration of silicate–metal in a greyish-white recrystallized matrix, studded with numerous sulphide specks. We have noted the presence of shock veins piercing through the silicate matrix, and some irregular fracture lines on the fusion crust are probably developed due to hammering.

Microscopic examination reveals the presence of few chondrules, mostly comprising olivine. Barred olivine chondrule is rarely present (Figure 1 *b*). Troilite (FeS) is the most dominant opaque, followed by Fe–Ni metal (Fe: 75–93 wt%; Ni: 5.5–24 wt%). Secondary feldspar (>50 μm) is also common. In view of higher textural integration, it is difficult to discriminate the chondrule mineral phases from those of the matrix. Based on the olivine composition (mean Fa (Fayalite): 26.15 mol%; range: ~25.76–26.43; standard deviation: 0.25), Komargaon meteorite is assigned to L-group chondrite. Percentage of mean deviation of Fa (<1.5) further suggests a higher degree of thermal equilibration that corresponds to petrologic type-5 (ref. 1). Minor element data of olivine with mean composition, CaO: 0.04 wt%, TiO_2: 0.02 wt%, Al_2O_3: 0.03 wt%, Cr_2O_3: 0.04 wt% and MnO: 0.54 wt% respectively, fall well within the reported data of L5 chondrite[2].

Our preliminary assessment suggests that the Komargaon meteorite resemble ‘ordinary chondrite’ that constitutes >85% of the observed fall. Furthermore, it may be classified as L (low iron) group on the basis of Fe content of major silicate minerals. It has been assigned type 5 or higher petrologic grade due to absence of readily recognizable chondrules and presence of relatively large-sized secondary feldspar[1]. The Indian subcontinent being one of the most thickly populated countries records the maximum observed falls and therefore any new fall is always important not only to enhance the fall statistics of the World Meteorite Database, but also help in the reconstruction of orbital trajectory and understanding the dynamics of the main asteroid belt.

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