Volcanic ash beds

We thank Subhrangsu Kanta Acharyya (SKA) for his interest in our paper[1], and for offering comments[2] on the same, which in our opinion, are a result of misunderstanding the geologic setting and stratigraphic position of the Kalka volcanic ash, with respect to volcanic rocks, other ash units and the chert breccia mentioned by him.

We are aware of reports of volcanic rocks and ash beds from the Himalayan Foreland Basin (HFB)[3–5]. However, these are neither similar nor related to the Kalka volcanic ash. In support of our stand, we would like to reiterate the key parameters of the Kalka ash. The Kalka ash bed occurs sandwiched between two coal seams in the basal part of the Subathu Formation, which is considered as Thanetian (Late Palaeocene) on the basis of diagnostic foraminifera like *Daviesina* and *Lockhartia*[6,7]. Thus the Kalka volcanic ash is of Late Palaeocene age, and not Early Eocene as assumed by SKA. Keeping these facts in focus, our reply to SKA's comments is as follows:

(i) In the Jammu region, the chert breccia occurs just above the Sirban Limestone (Precambrian) and considerably below the coal units of the basal Subathu Formation. There is ambiguity about its stratigraphic relationship and age. Bhandari and Agarwal[8] considered it as top of the Sirban Limestone, P. Singh[9] as a discrete unit (Khargala Chert Breccia) of Early Palaeocene–Cambrian age, whereas B. P. Singh[10] included it in the basal interval of the foreland succession, considering it as of Late Palaeocene age. Although we have not observed the chert breccia at Salal village, we did study the same at Kalakot. The chert breccia of Kalakot is quartz (detrital)-dominant and consists (in wt%) of 92.31 SiO_2, 3.14 Al_2O_3, 0.37 K_2O, 0.21 TiO_2, 0.59 Fe_2O_3, 0.15 CaO, 0.005 P_2O_5 and 1.4 loss on ignition, with low concentration (in ppm) of trace elements (Zr = 79, Nb = 5.5, Sc = 2, Ni = 2, Y = 7.9, Pb = 3.3, Th = 0.7, Sr = 5 and Rb = 10.6; N. Siva Siddaiah, unpublished). Clearly, the mineralogy and geochemistry of Kalakot chert breccia do not support its volcanic nature. In fact, SKA himself, mentions that the rhyolitic character of chert breccia remains unrecognized[2]. Thus, neither the stratigraphic position nor mineralogical/geochemical composition of chert breccia is similar to that of the Kalka volcanic ash.

(ii) Regarding the 'volcanic ash' that occurs associated with vertebrate fossils in the topmost part of the Subathu Formation at Sindkhatuti (Jammu and Kashmir), little information is available, excepting mere mention in a few publications[3]. We did not refer to it because first, no mineralogical and geochemical data are available to confirm its volcanic nature, and secondly, it is much younger compared to the Kalka ash. We may add here that the 'Sindkhatuti ash' is not of Late Eocene age, but of Middle Eocene age as inferred from the associated mammal fauna.

(iii) The volcanic rocks reported from the Peontra area in the Lesser Himalaya[4] are from younger levels (Eocene) of the Subathu Formation compared to Kalka volcanic ash. Similarly, volcanic rocks from Dowar Khola in Nepal and Abor in Arunachal Pradesh[5] are also of Eocene age. Moreover, the major, trace and REE abundances of these rocks from the HFB are not comparable with those of the Kalka volcanic ash.

(iv) Therefore, the volcanic rocks known so far from the HFB are neither coeval nor consanguineous to the Kalka volcanic ash. We maintain that the Kalka ash is unique because it occurs associated with coal seams of Thanetian age, and is the oldest volcanic ash reported thus far from the HFB.

(v) 'Tonsteins' by definition are kaolinite-dominated volcanic ash beds associated with coal seams. The Kalka volcanic ash is kaolinite-dominated (>95 volume %), and occurs sandwiched between coal seams, and thus it is a tonstein. Since this is the only tonstein found so far in the Subathu Formation, naming it as 'Basal Subathu Tonstein' is justified for facilitating stratigraphic correlation.

1. Siddaiah, N. S. and Kumar, K., *Curr. Sci.*, 2007, **92**, 118–125.
2. Acharyya, S. K., *Curr. Sci.*, 2008, **94**, 157–158.
3. Nanda, A. C. and Kumar, K., Excursion guide on the Himalayan Foreland Basin (Jammu–Kalakot–Udhampur sector). Spl. Publ., Wadia Institute of Himalayan Geology, Dehradun, 1999, vol. 2, pp. 1–85.
4. Prashra, K. C., *Bull. Indian Geol. Assoc.*, 1986, **19**, 9–15.
5. Acharyya, S. K., *J. Asian Earth Sci.*, 2007, **31**, 1–17.
6. Mathur, N. S. and Juyal, K. P., Atlas of Early Palaeogene invertebrate fossils of the Himalayan foothills belt. Monogr. Wadia Institute of Himalayan Geology, Dehradun, 2000, p. 257.
7. Bhatia, S. B. and Bhargava, O. N., *J. Asian Earth Sci.*, 2006, **26**, 477–487
8. Bhandari, L. L. and Agarwal, G. C., *Eocene (Subathu Series) of the Himalayan foothills of North India*, CAS in Geology, Panjab University, Chandigarh, 1967, vol. 3, pp. 57–77.
9. Singh, P., *The Subathu Group of India*, Nav Jyoti Scientific Publications, 1980, Professional Paper, 1, p. 92.
10. Singh, B. P., *Earth Planet. Sci. Lett.*, 2003, **216**, 717–724.

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Response:

Siddaiah and Kumar claim awareness regarding reports on Late Palaeocene–Eocene volcanic rocks from the HFB[1,2]. However, they did not cite any of these studies, although they consider their own report[3] a good proxy to understanding volcanism and tectonism associated with the Himalayan collision. Their claim that the Kalka ash bed is Late Palaeocene in age is unsubstantiated, as the diagnostic Late Palaeocene foraminifera like *Daviesina* are reported from Jammu area[4,5] and not from the Subathu Formation type area. Coal, carbonaceous shale beds from the Subathu Formation and equivalent beds from the Lesser Himalaya are regarded Early Eocene in age[6]. Siddaiah and Kumar are confused about the nature and stratigraphy of the chert breccia from Jammu area and cite outdated references of 1967 and 1980. The stratigraphy at Salal area is now well described[4]. A thin kaolinitic soil occurs over the unconformity against the Precambrian dolomite, which is followed by 3–4 m reworked bauxite[4]. The rhyolitic and agglomeratic nature of the breccia in Salal area is documented by photomicrographs[7]. Siddaiah and Kumar admit that they have not studied the chert breccia at Salal village. They also misunderstood the remark 'rhyolitic character of chert breccia remains unrecognized'[8]. It was meant to imply that although the presence of rhyolitic tuff and agglomerate was recorded in 1979, later workers have ignored this report and did not take up specific follow-up studies.

The Sindkhatauti ash bed with vertebrate remains from Kalakot area, Jammu, is accepted by Siddaiah and Kumar to correspond to the 'top most part of the Subathu Formation', which corresponds to Late Eocene age. Volcanic beds of Eocene age occur at different levels of the Subathu and equivalent formations from the HFB[1,2,8]. Their nature mostly different from the Kalka ash bed notwithstanding, they are equally important proxies to understand the nature of volcanism and tectonism associated with the Himalayan collision.

Thus the rhyolitic chert breccia from the Salal area, Jammu, associated with bauxite is Late Palaeocene in age[7,8] and represents the oldest tuff–agglomerate horizon from the Subathu Formation. The Kalka ash bed associated with coal seams, occurring at a higher stratigraphic level is younger and cannot be named as 'Basal Subathu Tonstein'.

1. Acharyya, S. K., *Gondwana Res. Group, Mem.*, 1999, **6**, 263–271.
2. Acharyya, S. K., *J. Asian Earth Sci.*, 2007, **31**, 1–17.
3. Siddaiah, N. S. and Kumar, K., *Curr. Sci.*, 2007, **92**, 118–125.
4. Singh, B. P., *Earth Planet. Sci. Lett.*, 2003, **216**, 717–724.
5. Bhatia, S. B. and Bhargava, O. N., *J. Asian Earth Sci.*, 2006, **26**, 477–487.
6. Sahni, A., J. B. Auden Lecture, Wadia Institute of Himalayan Geology, 1999, p. 27.
7. Anon., *News Geol. Surv. India*, 1979, **10**, 5–8.
8. Acharyya, S. K., *Curr. Sci.*, 2008, **94**, 157–158.

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A simple and economical device to save water in water distillation systems in laboratories

A serious problem currently faced by the world is water crisis. Due to the enormously wasteful and therefore, non-sustainable use of water by us, groundwater levels are decreasing at an alarming rate. The water distillation units used in almost every science laboratory, need running water to cool the steam and thus provide distilled water. The quantum of running water typically allowed to flow down the drain in the usual glass or steel distillation units can be almost 800–1000 litres for every 10 litres of distilled water produced. We describe here one simple device which can save many hundreds of litres of water everyday from going down the drain during production of distilled water (or other distillation products).

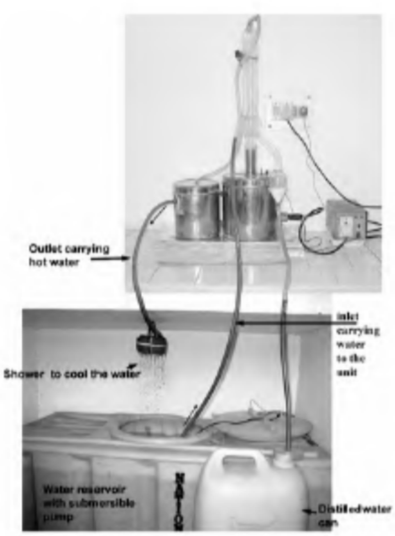

Figure 1. Distillation plant assembly.

We use a typical water storage tank (300 litres capacity) with a small submersible pump (commonly used in room coolers and costing between Rs 120 and 150) to force the water to flow through the condensing unit. The water flowing out of the condenser returns back to the same tank, but through a perforated disc (4–6″ dia) positioned over the wide mouth of the tank at a height of 12 inches or more, so that the water flows through the perforated disk like a shower. This allows the water to be cooled as it falls into the storage tank and is thus suitable for recirculation (Figure 1). In this way, no water is wasted and since it gets sufficiently cooled, it does not compromise with the efficiency of the condensing unit. We have used this system in our laboratory continuously for 8–10 h every day, with the ambient temperature being 40°C or more. After the distillation unit is turned-off in the evening, the water circulation system is allowed to continue for an additional 4–5 h so that the water in the tank gets fully cooled for next round of distillation. The water in the storage tank may be used at least for a week without replacement. Only when it accumulates organic and inorganic load, it may be replaced. Larger diameter of the shower disc, its placement at a greater height and a larger reservoir can increase the cooling efficiency. The water-cooling efficiency, however, may be affected under conditions of high humidity (e.g. during monsoon months).

Thus 800–1000 litres of tap water may be saved for every single distillation unit everyday. Given the universal requirement of one or more distillation unit/s in classrooms and research laboratories, addition of a simple and economic device like this can save millions of gallons of precious water everyday.

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