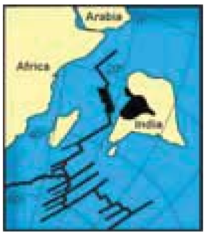

The Deccan beyond the plume hypothesis

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Summary

The widely accepted mantle plume model (*e.g., Morgan*, 1981; *Richards et al.*, 1989; *Campbell & Griffiths*, 1990) postulates that (i) the currently active Réunion Island, in the Indian Ocean, is fed by the narrow "tail" of a mantle plume that rises from the core-mantle boundary, (ii) the Deccan continental flood basalt (CFB) province of India originated from the "head" of the same plume during its early eruptive phase near the end of the Cretaceous, and (iii) the Lakshadweep-Chagos Ridge, an important linear volcanic ridge in the Indian Ocean, is a product of this plume. It is not generally appreciated, however, that this so-called "classic" case of a plume contradicts the plume model in many ways. For example, there is little petrological evidence as yet that the Deccan source was abnormally hot, and the short (~ 1.0 – 0.5 Myr) duration claimed by some for the eruption of the Deccan is in conflict with recent Ar-Ar age data that suggest that the total duration was at least ~ 8 Myr (*Sheth et al.*, 2001a,b). The Deccan CFB was associated with the breakup of the Seychelles microcontinent from India (*e.g., Mahoney*, 1988). Geological and geophysical data from the Deccan provide no support for the plume model and arguably undermine it altogether (*Sheth*, 2005a,b). The interplay of several intersecting continental rift zones in India is apparently responsible for the roughly circular outcrop of the Deccan. The Lakshadweep-Chagos Ridge, and the islands of Mauritius and Réunion, are located along fracture zones, and the systematic southerly age progression along the Ridge (though questioned) may be a result of southward crack propagation through the oceanic lithosphere. This idea avoids the problem of a 10° palaeolatitude discrepancy which the plume model can only solve with the *ad hoc* inclusion of mantle roll. Published Ar-Ar age data for the Lakshadweep-Chagos Ridge basalts have been seriously questioned (*Baksi*, 1999, 2005), and geochemical data suggest that they likely represent post-shield volcanism (*Sheth et al.*, 2003) and so are unsuitable for hotspot-based plate reconstructions. "Enriched" isotopic ratios such as higher-than-N-MORB values of $^{87}Sr/^{86}Sr$, observed in basalts of the Ridge and the Mascarene Islands may mark the involvement of delaminated enriched continental mantle instead of a plume (*Smith*, 1993). High values of the $^{3}He/^{4}He$ ratio also do not represent a deep mantle component or plume (*Anderson*, 1998a; 1998b). The three Mascarene Islands (Mauritius, Réunion, and Rodrigues) are not related to the Deccan but reflect the recent (post-10 Ma) tectonic-magmatic development of the African Plate.

I relate CFB volcanism to continental rifting, which often (but not always) evolves into full-fledged sea-floor spreading (*Sheth*, 1999a, 2005a). I ascribe the rifting itself not to mantle plume heads but to large-scale plate dynamics, possibly aided by long-term thermal insulation beneath a supercontinent which may have surface effects similar to those predicted for "plume incubation" models. Non-plume, plate tectonic models are capable of explaining the Deccan in all its greatness.

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Figure 1. The 1,200-m-thick exposed section through the Deccan basalt pile at Mahabaleshwar, Sahyadri (Western Ghats) region. Grand! Photo by Hetu Sheth.

Since the rapid rise to dominance of the plume-head/plume-tail model for flood basalts (*Richards et al.*, 1989; *Campbell & Griffiths*, 1990), hundreds of papers have invoked, or supported, a plume head origin for the Deccan Traps of India. These papers are in unanimous agreement on two issues: (i) the Deccan originated from the ancestral Réunion hotspot which upwelled beneath India in the late Cretaceous, and (ii) the hotspot, now located on the African plate, is fed by a deep mantle plume. The overall appearance of the Deccan, with its roughly circular outcrop, and the linear Laccadives-Chagos (more correctly, Lakshadweep-Chagos) Ridge to the south of India, looks very much like what is expected for a spherical plume head and a narrow plume tail (Figures 2 & 3). Nevertheless, the following observations and deductions suggest that the plume model is not valid for the Deccan (*Sheth*, 1999a,b, 2005a).

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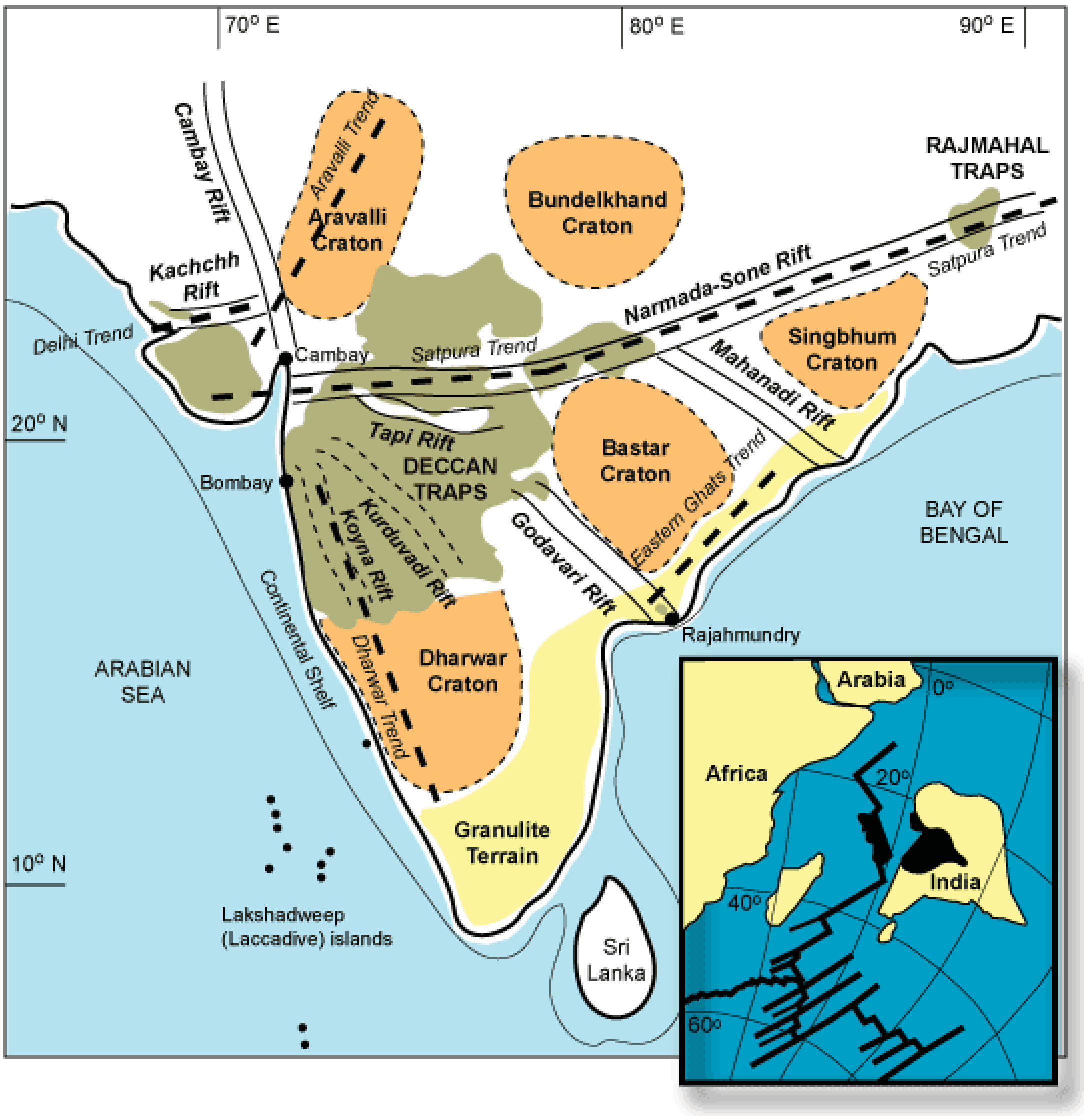

Figure 2. Map showing the approximate boundaries of the Precambrian cratons making up the Indian shield (e.g., Pandey & Agrawal, 1999; Naqvi & Rogers, 1987), the granulite terrain, the Precambrian structural trends (heavy broken lines), rift zones crossing peninsular India (e.g., Biswas, 1987), and the present outcrop areas of the Deccan and Rajmahal flood basalts. Inset shows the breakup of the Seychelles microcontinent, situated along the northern tip of the Mascarene Plateau (black), from India, soon after the Deccan flood basalt episode (after Norton and Sclater, 1979; Mahoney, 1988). The Koyna and Kuruduvadi "rifts" have been proposed based on gravity surveys and may represent humps of the granitic basement rather than rifts.

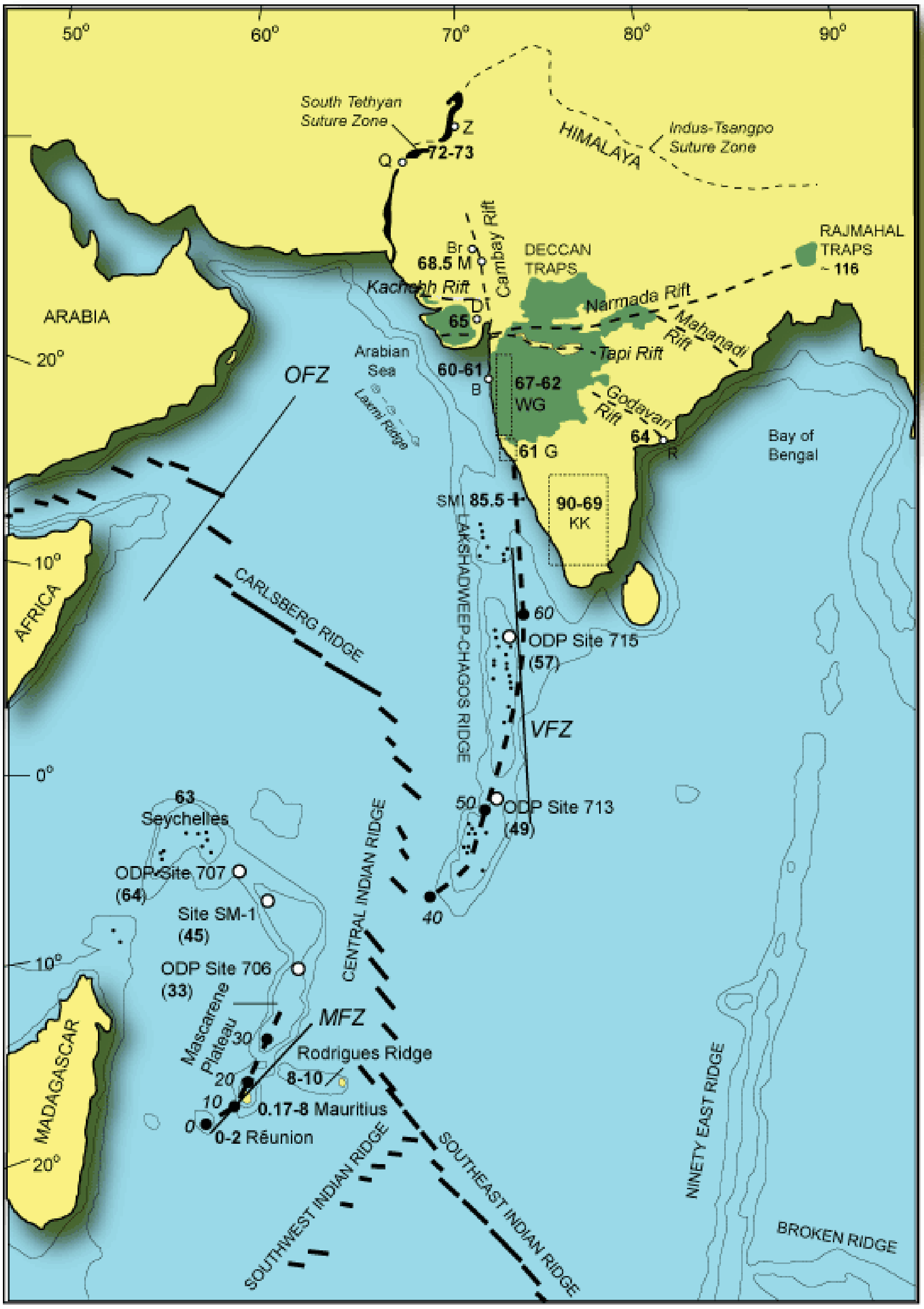

Figure 3. Prominent structural-tectonic features of southern Asia and the Indian Ocean basin (based on Mahoney et al., 2002). Abbreviations for localities are: Q, Quetta; Z, Zhob; B, Barmer, M, Mundwara; D, Dhandhuka; B, Bombay; R, Rajahmundry. WG is the Western Ghats region (ages from Venkatesan et al., 1993 and others). ~ 64 Ma age for Rajahmundry basalts is from Baksi (2001a). G, ~ 61 Ma Goa dykes (Widdowson et al., 2000). KK, ~ 90-69 Ma Karnataka-Kerala dykes (e.g., Radhakrishna et al., 1994; Anil Kumar et al., 2001). SMI are the St. Mary's Islands volcanics (85.5 Ma, Pande et al., 2001), part of the Indo-Madagascar CFB which in India is otherwise represented by the KK dykes. The associated flood basalt lavas are not represented or known in India; there are many Precambrian dyke swarms throughout southern India as well. 72-73 Ma ages for Quetta and Zhob rocks and 65 Ma age for Dhandhuka-Botad lavas are from Mahoney et al. (2002), as also the modelled hotspot track showing expected ages in Ma. Note the rift zones underlying the Deccan, and the absence of any triple junction. OFZ, Owen Fracture Zone; MFZ, Mauritius Fracture Zone; VFZ, Vishnu Fracture Zone. Click here for enlargment.

Abnormally hot mantle? There is no evidence for "abnormally hot" mantle sources for the common and voluminous Deccan basalts (Figure 4). Some picritic liquids are encountered in boreholes in the northwestern Deccan and in the Narmada region (*Krishnamurthy et al.*, 2000). The borehole lavas were conjectured by *Campbell & Griffiths* (1990) to be high-temperature, high-melt-fraction liquids from the plume axis. *Peng & Mahoney* (1995), however, found that they are somewhat alkalic and could be high-pressure, low-degree melts. The Deccan flood basalt sequence is best developed in the Western Ghats region with ~3 km of stratigraphic thickness (Figures 1-3), and picritic basalts are found there, but these are enriched in cumulus olivine and clinopyroxene and do not represent liquid compositions. The parental melts of these picrites are estimated to have contained only ~ 9-10% MgO (*Beane & Hooper*, 1988; *Sheth, 2005b*).

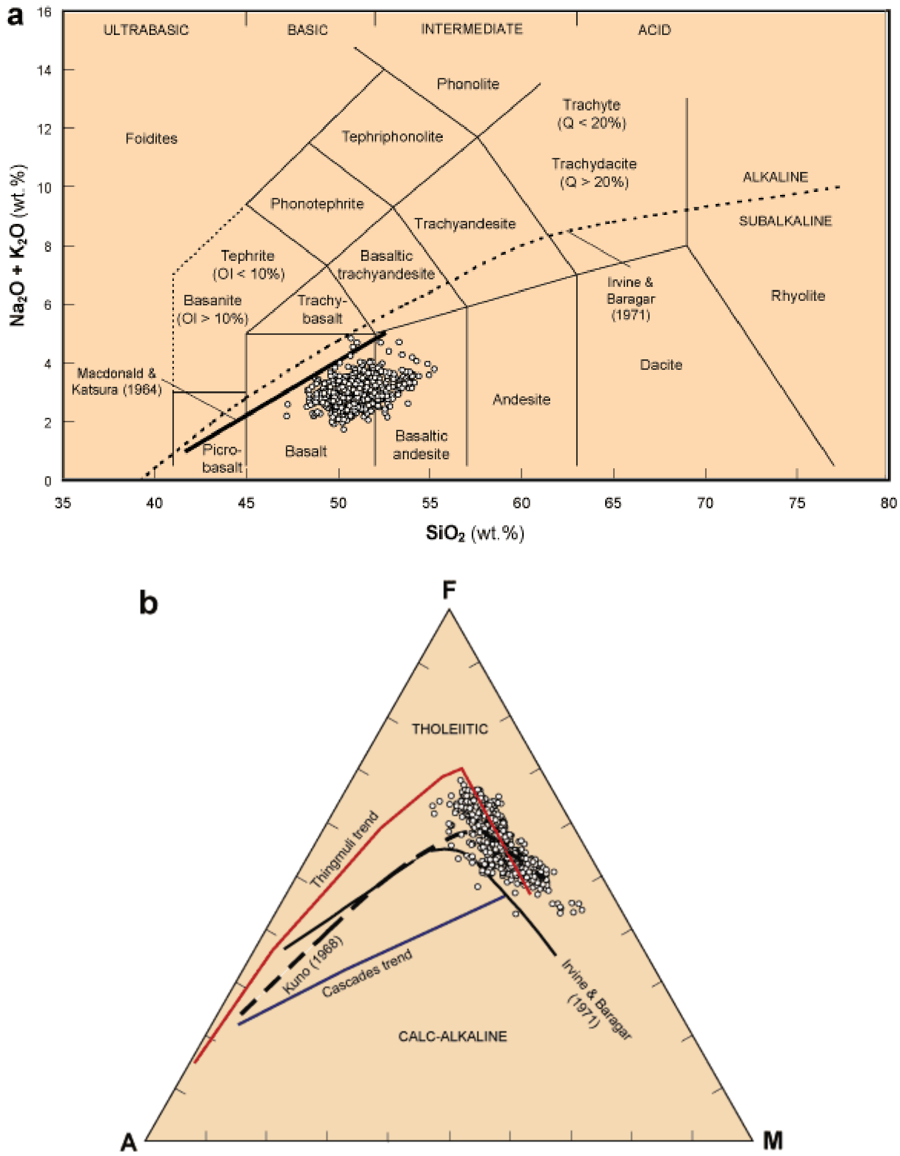

Figure 4. (a) A plot of 624 samples of Deccan basalts of the Western Ghats (data of Beane, 1988; courtesy J. J. Mahoney) on the well-known TAS diagram. Note the complete absence of compositions other than basalt and basaltic andesite, and the nearly exclusive subalkalic (tholeiitic) nature. Dividing lines between alkalic and subalkalic fields proposed by Macdonald & Katsura (1964) and Irvine & Baragar (1971) are also shown. (b) Plot of the same samples on the familiar AFM diagram, showing the Fe enrichment trend typical of tholeiitic basalts. Typical tholeiite trend (Thingmuli, Iceland) and calc-alkaline trend (Cascades) are also shown, along with boundaries between the two fields proposed by Kuno (1968) and Irvine & Baragar (1971). See Sheth (2005b) for an extended petrological discussion.

Very short (1 – 0.5 Myr) eruptive duration? Very rapid emplacement of the Deccan Traps is one of the key arguments for a plume origin, though also not incompatible with plate-related and stress-caused mechanisms. The duration of volcanism has also been one of the most debated issues. Recent ^{40}Ar-^{39}Ar data for trachyte and basalt flows from Bombay (*Sheth et al.*, 2001a,b) suggest the total duration to have been no less than ~ 8 – 9 Myr. There may have been a major, rapid, short-duration eruptive phase in the Western Ghats, estimated by some to have lasted only 1.0 – 0.5 Myr (*e.g., Duncan & Pyle*, 1988; *Courtillot et al.*, 1988; *Hofmann et al*., 2000), and by others 4 – 5 Myr (*Venkatesan et al.*, 1993; *Pande*, 2002). Also, the data do not always justify the arguments advanced. *Allègre et al.* (1999) report an Re-Os isochron age of 65.6 ± 0.3 Ma (2σ) for several lava flow samples, arguing for a very short duration for the volcanism. That random, non-comagmatic samples collected across an area 1000 km wide and and at various topographic-stratigraphic levels should define an isochron is remarkable, but the goodness-of-fit (*F*) value for the claimed isochron, which was not reported, is 22 (*Baksi*, 2001b); the line is clearly an "errorchron" (*Faure*, 1986).

Catastrophic eruption rates? Some authors have explained "the extremely high lava eruption rates" in CFBs by hot plume heads, though there is no direct and simple relationship between melt production and melt eruption (Th. Thordarson, pers. comm., 2005). A large proportion of the Deccan basalts comprise pahoehoe compound lava flows (*e.g., Walker*, 1970; *Bondre et al.*, 2004a,b). My own fieldwork at scores of places in the Deccan, and on the Kilauea volcano, Hawaii (*Sheth*, 2003), shows that the size and scale of individual flow units of many large Deccan compound flows are the same as those of modern Kilauea lava flows (Figure 5).The large volumes of the individual Deccan lava flows compared to the Hawaiian flows may reflect in part the great amount of decompression during India-Seychelles continental breakup (Figure 2 inset), considerable lengths (40 – 50 km) of the fissure systems (Figure 6; see also *Self et al.*, 1997), excess source fertility (*Sheth*, 2005b), mantle volatiles such as CO_2 (*Presnall & Gudfinnsson*, 2005), and similar features.

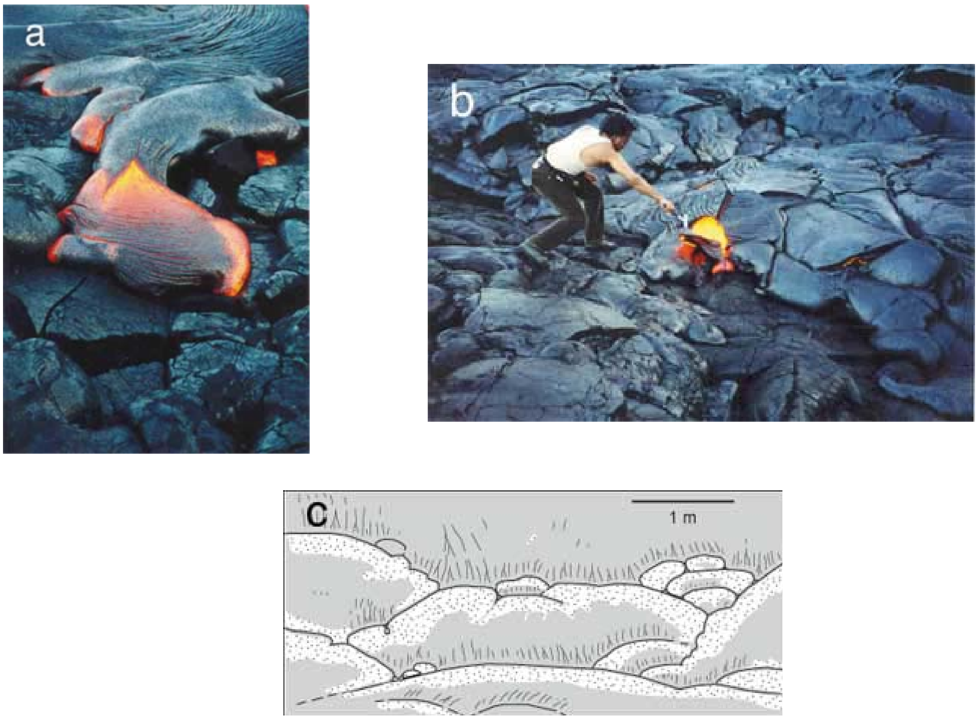

Figure 5. (a) The newborn toe of a compound pahoehoe basalt flow that has emerged from under the solidified lava crust, as a "breakout". The front is about 1 m from the camera and 0.5 m wide. Ropes are forming in the frontal part and satellite breakouts emerge at right and left (bright yellow portions). Kilauea, Hawaii, May 2002. Photo by Hetu Sheth. This is how I believe the compound pahoehoe flows of the Deccan were emplaced. (b) Broader view of the actively inflating pahoehoe compound flow containing the lobe shown in (a). Note how numerous lobes are juxtaposed laterally and vertically. I am seen opening with the hammer the solidified roof of a lobe which yellow-hot magma (at ~ 1200°C) is filling. Kilauea, May 2002. Photo by Jyotiranjan Ray. This is how many compound pahoehoe flows of the Deccan look. Compare with (c). (c) Section across part of a compound pahoehoe lava flow of the Deccan, showing the distribution of vesicles and pipe vesicles. Some 17 flow units are seen. Modified from Walker (1970). Compare with (a) and (b).

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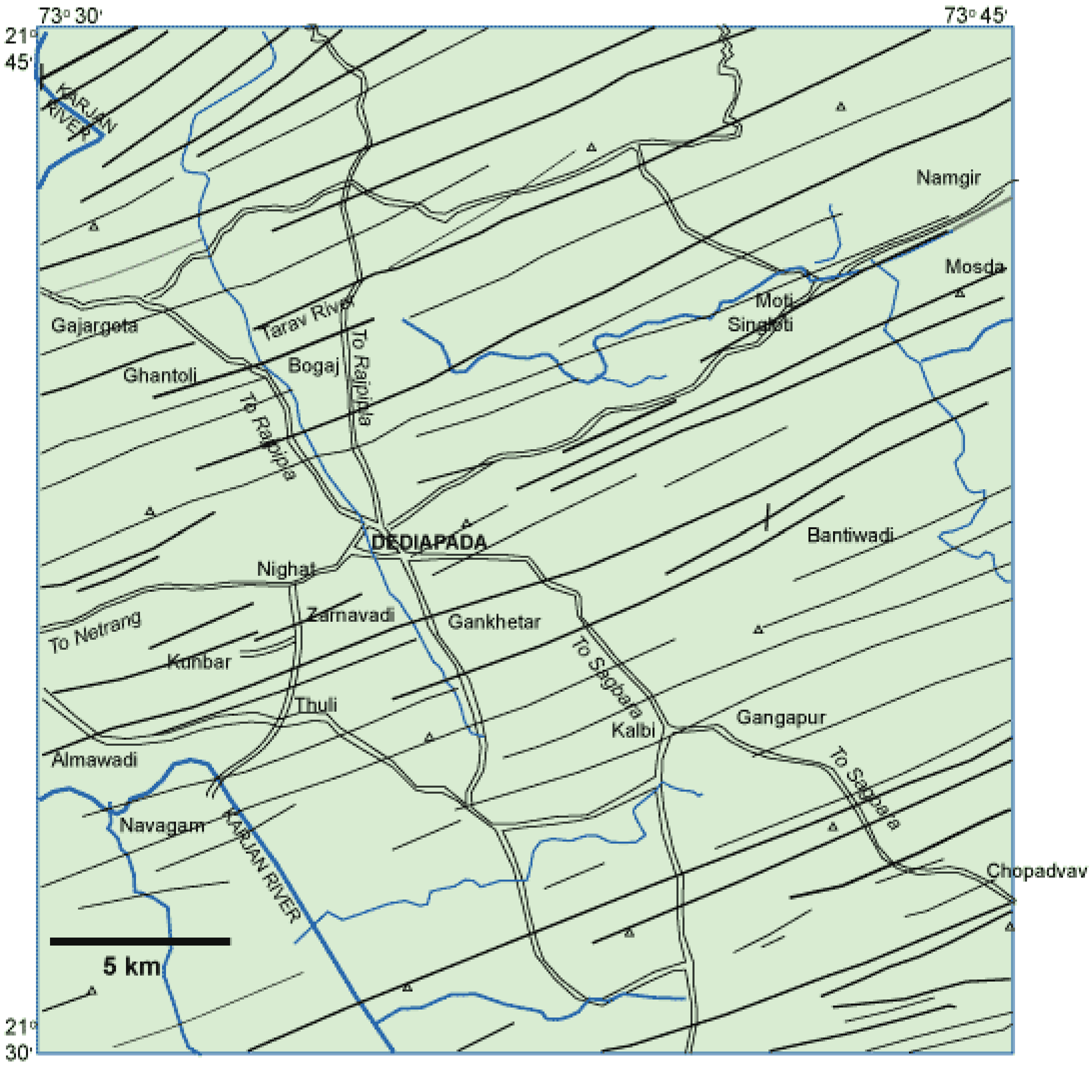

Figure 6. Map of the Dediapada dyke swarm in the Narmada-Satpura region of the Deccan (after Krishnamacharlu, 1970). This is one of the large, spectacular oriented dyke swarms of the Deccan Traps. Geochemical studies of these dykes are currently underway. Elevations are in metres.

Internal age progression? None exists within the Deccan (Figure 3). *Courtillot & Renne* (2003) suggested that the 60–61 Ma volcanic activity well within the Deccan (*e.g.*, at Bombay, *Sheth et al.*, 2001a,b), was "minor", and that the duration of Deccan volcanism was indeed very short. However, (a) this activity is not minor; large volumes of lava are emplaced in the subsurface along the west coast, and there is a scarcity of geochronological data. In comparison, the Western Ghats section has been heavily sampled and dated. (b) Whatever its magnitude, the late-persisting volcanism must be still explained without *ad hoc* auxiliary hypotheses. It is not. For example, according to prevalent views the plume head was all consumed in a quick phase around 66 – 65 Ma, and the predicted 60 Ma volcanic basement to the south of India, on top of the Maldives Ridge, should have formed from the narrow (100 – 200 km wide) plume tail. It is not clear how this plume tail could produce basalt in Bombay, 1,000 km to the north, at 60.5 Ma (*Sheth et al.*, 2001b). Suggestions such as northward dragging of the plume tail by the plate are *ad hoc*, and such drag and tilting would make impossible any systematic age progression in the first place. Furthermore, if the ~ 69 Ma mafic dykes reported from Kerala, southernmost India (*Radhakrishna et al.*, 1994) do represent early Deccan-related magmatism, as *Sheth* (1999b) considered likely, an entirely different, non-plume, passive, continental-breakup-related model for Deccan volcanism is even more attractive.

Enriched mantle: plume or continent? *Smith* (1993) proposed that ocean-island volcanism is derived from enriched continental mantle delaminated from a continent rifted along an ancient suture (see also Lithospheric delamination page). "Enriched" isotopic ratios such as higher-than-

N-MORB values of $^{87}Sr/^{86}Sr$, for example, are usually taken as plume signatures. However such compositions may instead mark involvement of shallow-level, enriched continental mantle. High values of $^{3}He/^{4}He$ may also be explained by shallow models (*e.g., Anderson*, 1998a, 1998b; see also Helium fundamentals page). The ~ 68.5 Ma alkalic complexes (Mundwara, Barmer) in the northern part of the Deccan province, related by *Basu et al.* (1993) to the Réunion plume based on Sr and He isotopic ratios, could thus be derived from the continental mantle.

The "enriched" plume model was never required to explain continental intraplate volcanism, given the abundance of "enriched" mantle domains within the continental lithosphere itself. The plume model was extrapolated to continental magmatism from the ocean basins based on the world view that the oceanic mantle was entirely "depleted", MORB-like, convecting and homogeneous. The reasoning was that anything "enriched" or anomalous had thus to come from plumes (*Anderson*, 1996; *Smith & Lewis*, 1999). However, if continental mantle is introduced into the oceanic mantle, *e.g.*, by delamination during continental breakup (*e.g., Smith*, 1993), enriched plumes are not required to explain either continental or oceanic intraplate volcanism, and the whole argument can be turned around. Rather than the Deccan having formed from a deep mantle plume now located under Réunion island, Réunion volcanism may be in part sourced from delaminated Indian continental mantle.

Mahoney et al. (2002) recently reported Réunion-like elemental and isotopic compositions for mafic ophiolitic rocks, dated by them at 72 – 73 Ma, and outcropping in Pakistan. They opined that some of these may represent pre-Deccan oceanic seamounts. The associated intrusions were emplaced in continental shelf-and-slope-type marine sediments along the northern margin of India. *Mahoney et al.* (2002) considered the continental mantle delamination model, but argued that it does not explain Réunion-type volcanism occurring on the updrift side of India at 72 – 73 Ma, and concluded that the plume model is the most viable option. Notably, they supported the *plume-head-impact* model rather than the plume-head-incubation model, despite the ~ 8 Myr age gap between the Pakistani rocks and the 66 – 65 Ma voluminous basalt volcanism of the Deccan.

Nevertheless, the analyzed intrusions are located within the boundary of the Indian continental mantle, and the true oceanic seamounts may not have been far from the northern margin of India. Continental mantle delaminated during the early stages of India-Seychelles breakup could have migrated northward ahead of India and fed the seamounts built on oceanic lithosphere. The continent followed behind, and when it converged upon Asia it simply overrode these seamounts. This is a better explanation for the observations than the plume model. If the lateral flow of continental mantle proposed here seems *ad hoc*, note that the mechanism of long-distance lateral flow is required even by the plume model, as for the Rodrigues Ridge (*Morgan*, 1981; Figure 3) which is not located along the conjectured Deccan-Réunion hotspot track and trends roughly E-W. The rocks analyzed by *Mahoney et al.* (2002) and *Basu et al.* (1993) are undersaturated and alkalic, and have ocean-island-basalt-type characteristics (*e.g.*, Sr isotopic ratios), but rather than being melts from a hot plume, they may be melts of carbonated lherzolite (see *Keshav & Gudfinnsson*, 2004).

The "hotspot track": plume under plate, or crack propagation? The claimed southerly younging age progression along the Chagos-Laccadive Ridge and up to Réunion Island (though duly questioned by *Baksi*, 1999, 2005) does not require a lithospheric plate moving over a fixed plume. It may be explained by southward crack propagation through the oceanic lithosphere (see below). The narrow "hotspot track" may represent localized melting and magma focusing from a wider area (the "transform-fault effect", *Langmuir & Bender*, 1984). In support of this, I note that the Chagos-Laccadive Ridge lies along the Vishnu Fracture Zone. The Ridge may mark the location of a major Gondwanic transform (*Reeves & de Wit*, 2000; *Reeves et al*., 2004).

It is possible that the current volcanism at Réunion Island may be unrelated to the Deccan geodynamically, though it taps delaminated Indian continental mantle brought beneath the African plate by the ridge jump at ~ 30 Ma (*Sheth*, 2005a; see also *Burke*, 1996). *Burke* (1996), a plume proponent, argued that the Deccan plume died out at 30 Ma and the Réunion plume is a different plume.

The Cambay triple junction and other fiction. Originally included by *Burke & Dewey* (1973) in their world-wide list of plume-generated triple junctions, the Cambay triple junction has been popularized by several subsequent papers supporting the Réunion plume model for the Deccan. However, the triple junction is not real (*Sheth*, 1999b, 2005a; Figures 2 & 3). Another unfortunate development is proliferation of model-dependent interpretations by which every geological and geophysical observation from the Deccan is interpreted an effect of the Réunion plume. For example, low-seismic velocity mantle underlying the Cambay rift of the Deccan is interpreted as a remnant of the plume (*Kennett & Widiyantoro*, 1999) instead of warm, low-density upper mantle welling up due to rift-related convection. This geophysical feature may even be a recent (post-Deccan) development (*Sheth, 2005a*).

Pre-volcanic lithospheric uplift, or lack thereof? Pre-volcanic lithospheric uplift of up to a few kilometres is an essential prerequisite for all thermal models such as the plume model. This is yet another issue on which specialists of different flood basalt provinces have come to diametrically opposed conclusions (*e.g., Czamanske et al.*, 1998; *He et al.*, 2003; *Tejada et al.*, 2004; *Saunders et al.*, 2005; see also Dhanjori page). *Campbell & Griffiths* (1990) cite the Deccan as a good example of a flood basalt with pre-volcanic uplift, but the Pachmarhi area mentioned by them as evidence for this appears instead to show the very opposite (recent uplift). Pachmarhi is on the Satpura horst between the Tapi and Narmada rifts. The very youthful landscape (*e.g.*, kilometre-high escarpments in the basement Gondwana sandstones) and several planation surfaces (as high as 1,300 m above MSL) indicate very recent uplift (*Ollier & Pain*, 2001).

The same is true of the Deccan plateau region, where the Deccan-basement contact is in the subsurface over vast areas. Major rivers draining the Deccan plateau are of the antecedent type, *i.e.*, they were in existence before the Western Ghats (Sahyadri Range) rose in their way, and the popular dome-flank drainage picture of the Indian drainage painted by *Cox* (1989) is highly speculative. The uplift of the Western Ghats is post-volcanic and recent (possibly Miocene and younger), and not pre-volcanic uplift produced by a plume (*Sheth, 2005a*). There are two possible interpretations: (1) Pre-volcanic lithospheric uplift occurred and then completely decayed and was overprinted by post-volcanic uplift. This is what plume proponents advocate. (2) Pre-volcanic uplift never did take place and the plume explanation is invalid. Option (2) is more plausible, and there is in fact actual support for it in the form of an uplifted, extensive planation surface below the Deccan lavas in central India (*Dixey*, 1970; see *Sheth, 2005a*). Note that the Western Ghats rise much higher in southern India (the region little or not affected by Deccan volcanism) than they do in the Deccan plateau region (Figure 7).

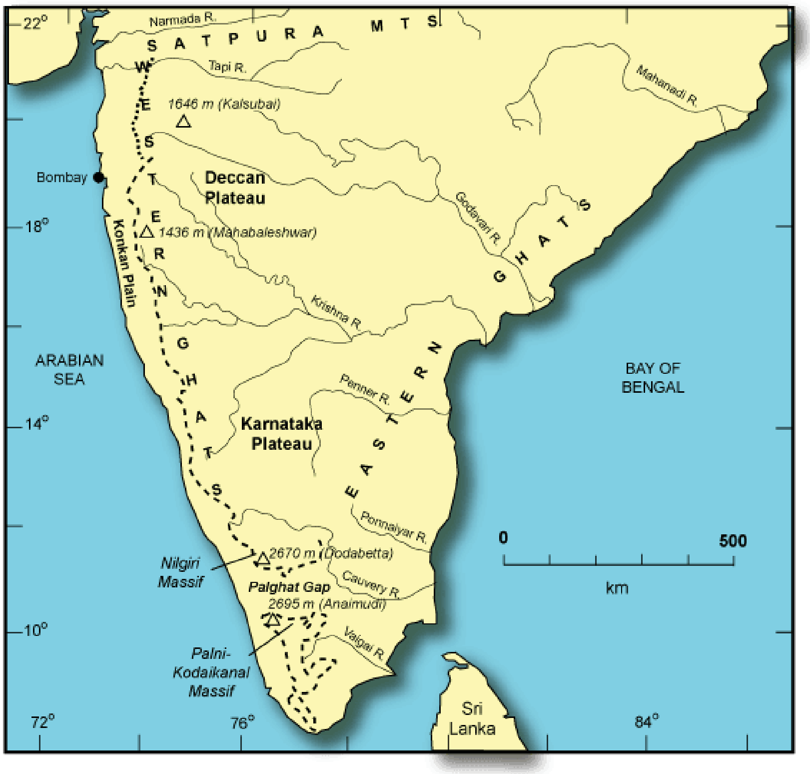

Figure 7. The main elements of the physiography of the Indian peninsula. The Western Ghats escarpment is shown by the heavy broken line. Note the pronounced easterly drainage. After Ollier & Powar (1985) and Sheth (2005a).

Palaeolatitudes: true polar wander or crack propagation? The Deccan lavas erupted at ~ 30°S latitude. Réunion Island is at 21°S today (Figure 8a). To explain this significant discrepancy in the framework of the plume model, some workers have proposed true polar wander (TPW) of the Earth's mantle (*e.g., Vandamme & Courtillot*, 1990). In this view, subsequent to the Deccan eruptions, the Réunion plume remained fixed in the mantle, while the mantle itself rolled like a ball, inside the lithospheric shell, in a northerly direction. Such speculation indicates well the extent of special pleading permitted within the plume model. *Burke* (1996) has questioned this postulated TPW.

I propose a much simpler alternative to the TPW, illustrated by the schematic diagram shown in Figure 8b. This is that the systematically changing palaeolatitudes between the Deccan and ODP Site 706 (33 Ma) indicate southward crack propagation in a northward-moving plate with the condition that the northward plate motion was faster than the southward crack propagation. The situation shown in Figure 8b is for a plate in the southern hemisphere. At time T1, there is an active volcano 1 at the crack tip at latitude 60°S. Between times T1 and T2, the crack tip has moved southward by 10°, but because the plate itself has moved north by 20°, the new volcano 2 at the crack tip has the latitude of 50°S. A similar progression occurs between times T2 and T3. Thus, although the crack tip propagates southward, the palaeolatitudes systematically become more northerly.

I conclude, based on diverse evidence, that the Réunion plume model for the Deccan is wrong.

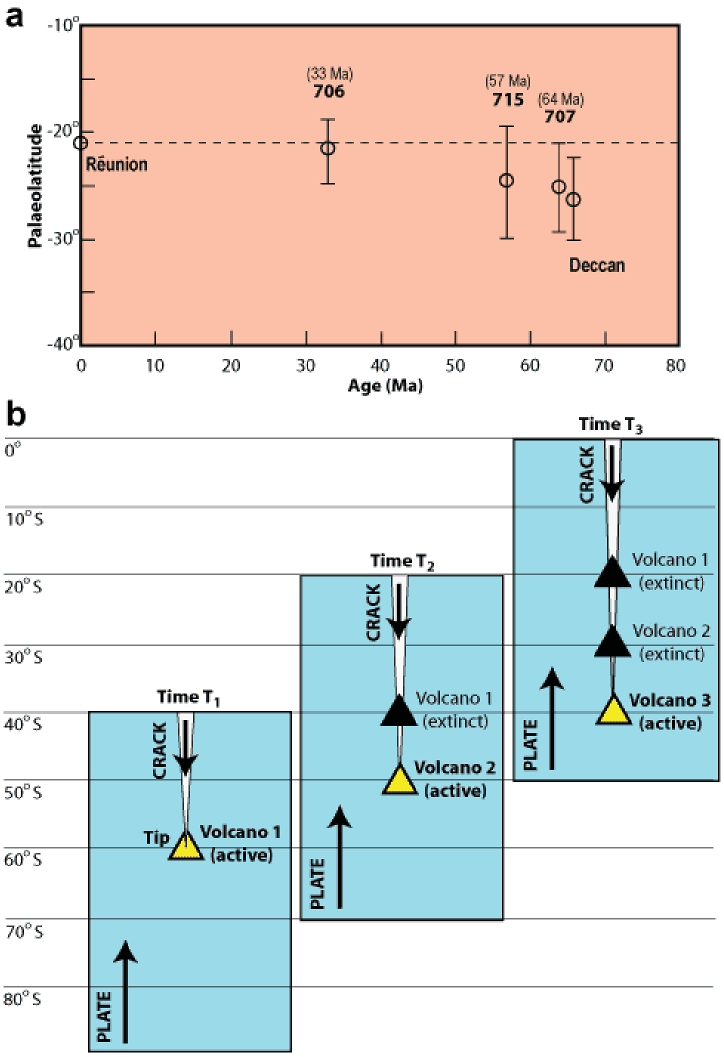

Figure 8: (a) Palaeolatitude variation from the Deccan to Réunion Island through the ODP Leg 115 sites (Vandamme & Courtillot, 1990). (b) Schematic cartoon showing the development of volcanism resulting from a crack propagating more slowly southward than the plate moves northward, in the Southern Hemisphere.

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Additional thoughts

Deccan volcanism was associated with the separation of the Seychelles microcontinent from India (Figure 2, inset), and this breakup itself is often ascribed to the Réunion plume head impact. I propose instead that the breakup occurred because of prolonged continental extension and an eventual ridge jump.

One interesting question is whether eclogite, a mantle rock more fusible than peridotite, could have been a source in part for the Deccan lavas. The rifted western continental margin of India follows the NNW-SSE Dharwar structural trend of the Precambrian southern Indian shield (*e.g., Biswas*, 1987). Also, the Narmada zone that crosses India has been proposed as an ancient suture between the southern (Dharwar) and northern (Aravalli) protocontinents (*e.g., Naqvi et al.*, 1974; *Naqvi & Rogers*, 1987; *Radhakrishna*, 1989). Such an ancient suture may have contained trapped, eclogitized oceanic crust. *Foulger et al.* (2005) recently proposed such a model for Icelandic volcanism, and *Sheth* (2005b) explored it in considerable detail for the Deccan. If eclogite constituted a major source for the Deccan, mantle fertility and not high mantle temperatures are implicated (see also *Yaxley*, 2000).

I have already explained why, despite all problems and anomalies, the whole Deccan province resembles so much what a plume-head/plume-plume tail is expected to create. The interplay of the Deccan rift zones is responsible for this. Several older sedimentary rift basins underlie the Deccan (Figures 2 & 3). These are the Cambay, Kachchh, Narmada-Tapi and Godavari rifts. They are not arranged radially, are much older than the Deccan, being of at least Jurassic age, and certainly were not produced by whatever produced the Deccan. The presence of several such major rifts means that lithospheric control (*Anderson*, 1998c), and lithospheric extension (*Sheth*, 2000) were important in Deccan volcanism. The nearly circular outcrop of the Deccan proper does not reflect a spherical plume head beneath, but simply results from the confluence of numerous rift zones and the continental margin in west-central India. This is a likely explanation because elsewhere, in the peripheral/outlier parts of the Deccan along individual isolated rifts, the lava outcrop is linear or localized (*e.g.*, the Deccan outliers of the Kachchh and Rajahmundry areas, the latter being on the Godavari rift near the east coast of India). The “hotspot track” on the oceanic crust, as argued above, may be related to melting and magma focusing along a southward-propagating fracture. The available seismic data for Réunion Island support the idea that its location is related to structural heterogeneity of the underlying lithosphere (*Charvis et al.*, 1999; *de Voogd & Pontoise*, 1999; *Hirn*, 2002).

In conclusion, a non-plume, plate-tectonic model involving continental breakup and related mantle convection and decompression melting, is suitable for the Deccan. If radial, focused flow of the upper mantle occurs (instead of vertical flow as in the plume model), a potentially unlimited volume of the mantle is available for processing.

The plume model was proposed for the Deccan more than 30 years ago, when little was known about the Deccan and about the plume mode of convection. Today we know a lot more about the Deccan, and the plume model becomes less tenable as our knowledge grows. The originators and champions of the plume model had little or no personal knowledge of the Deccan, and their broad generalizations should have been put to critical tests by regional experts on the Deccan. The tendency has been to assume a plume origin and infer the plume properties and characteristics based on whatever is required by the observations, but if volatiles, mantle fertility, continental geology, and dynamic, evolving plates are considered, one no longer needs mantle plumes (Sheth, 2005b). The new voices asking for new explanations (*e.g.,* http://www.mantleplumes.org/Deccan2.html) are a good sign. The plume model for the Deccan has been around for over thirty years, and has failed. A new, scientifically tenable non-plume model for the Deccan could be rapidly developed if only a few of the many Deccan/flood basalt enthusiasts share the task. We live in interesting times.

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