

ESEX Exchange

## Reply to the discussion on 'Barchan Dunes: why they cannot be treated as "solitons" or "solitary waves"'

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The authors (Livingstone *et al.*, 2005) base their comment on a fragment of a sentence from our paper Schwämmle and Herrmann (2003) taken out of its context. When we say 'pass through one another while still preserving their shape' we are commenting on the observation described in our paper that two barchans collide, form a compound, subsequently separate and finally after some time obtain again their original barchan shape. This, in fact, the authors do confirm to exist in several places of their comment. In that sense we see no contradiction in what we say in our paper (interpreting correctly the aforementioned fragment) and what the authors confirm to be observed in nature.

Concerning the problem of the conservation of sand mass, in our paper indeed we have no sand loss as opposed to Andreotti *et al.* (2002) or Herrmann and Sauerermann (2000). The reason for this is that in our paper we consider periodic boundary conditions so that the sand that flows out on one side flows in again on the other side. These boundary conditions mimic a piece cut out of a dune field and not an isolated pair of dunes. Probably the authors did not pay attention to this fine point.

Concerning the criticism of the authors that there are no observations of dunes emerging from a slip face, we would like to refer to a recent experimental paper performed by a Japanese group in which they observed exactly this phenomenon to occur (Endo *et al.*, 2004). The reason why on large-scale aeolian dune fields this phenomena has not been observed is very likely due to the time scales involved in dune motion. One would need observation times of several tens of years to fully follow it. The explanation that the authors give that dunes calve at the horns and subsequently wander towards the central part in front of the dune is pure speculation. Following the recent experiments of the Japanese group and our simulations, we think that there is enough evidence that the small dunes exactly in front of the large dune have emerged from the slip face.

Finally let us point out that the authors misunderstood our analogy to water waves. What we want to say is that when one dune 'crosses' the other dune, this does not mean that the grains of the dune behind themselves go over the dune in front but that as in water waves it is only the dune shape, i.e. the soliton, which goes through. Of course we are well aware that the transport in dunes occurs on the surface while water waves are a bulk phenomenon.

Summarizing, we do not think it is scientifically useful to base the criticism of our paper on a semantic dispute on a fragment of a sentence taken out of context. The fact is that our simulations do reproduce observations.

### References

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