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# Wind-blown dust

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# Outline

- Introduction
- Processes responsible for dust storms
- How-to model?
- Applicability of dust-storm model to small-scale emission estimation
- Summary



# Wind-blown dust: an outlook

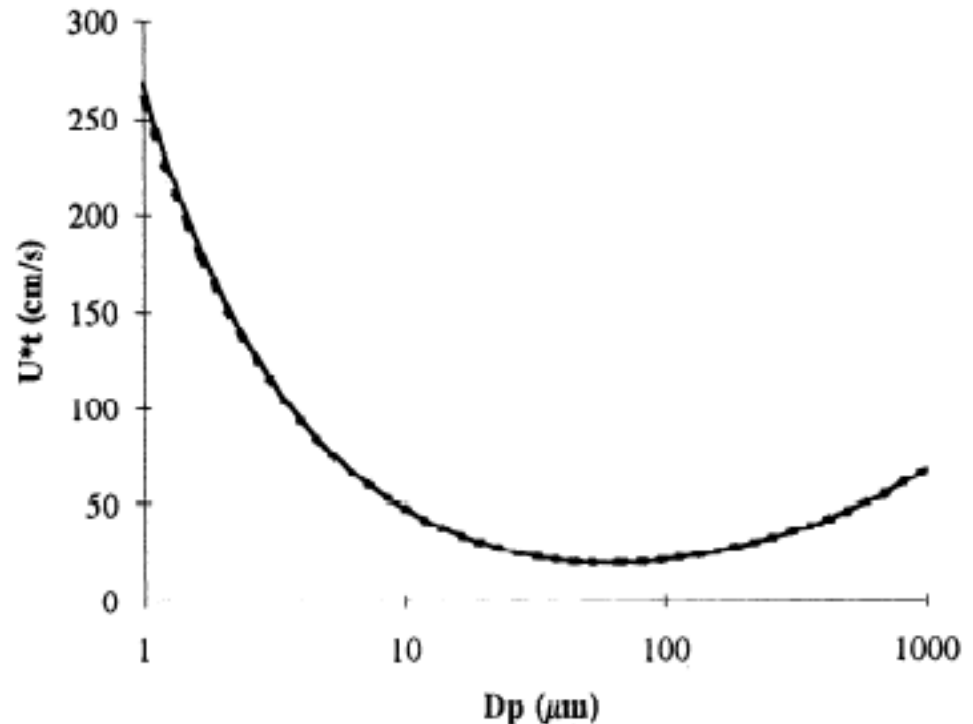


- The most powerful source of mineral material in the atmosphere
  - direct emission: ~1-5 Gt PM<sub>10</sub> / year
  - entirely dominant in North Africa, Arabian Peninsula, important in Asia and Australia
- Arguably the most-natural natural emission but:
  - deforestation, desertification
  - degradation of agriculture lands



# Mechanism of dust emission

- Energy supply: wind stress
- Storm formation: breaking the surface structure, tearing-off the particles
- Mechanism: sand-blasting
  - small particles cannot be easily lifted from the surface
  - large particles do not stay in air
- Clearly threshold-based process



Threshold friction velocity needed to tear-off the particle of particular size

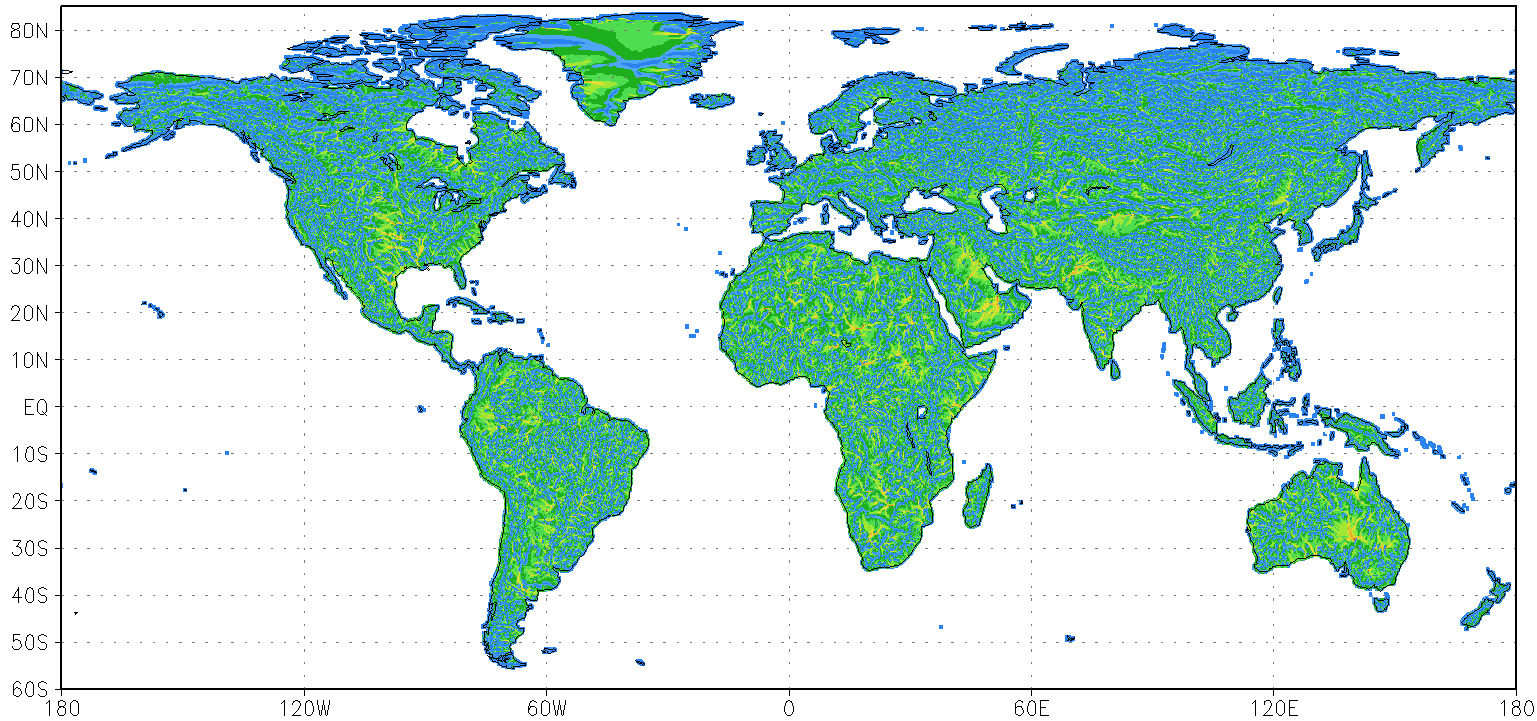
# Processes affecting dust emission



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Alluvial deposits, geomorphic for ECMWF

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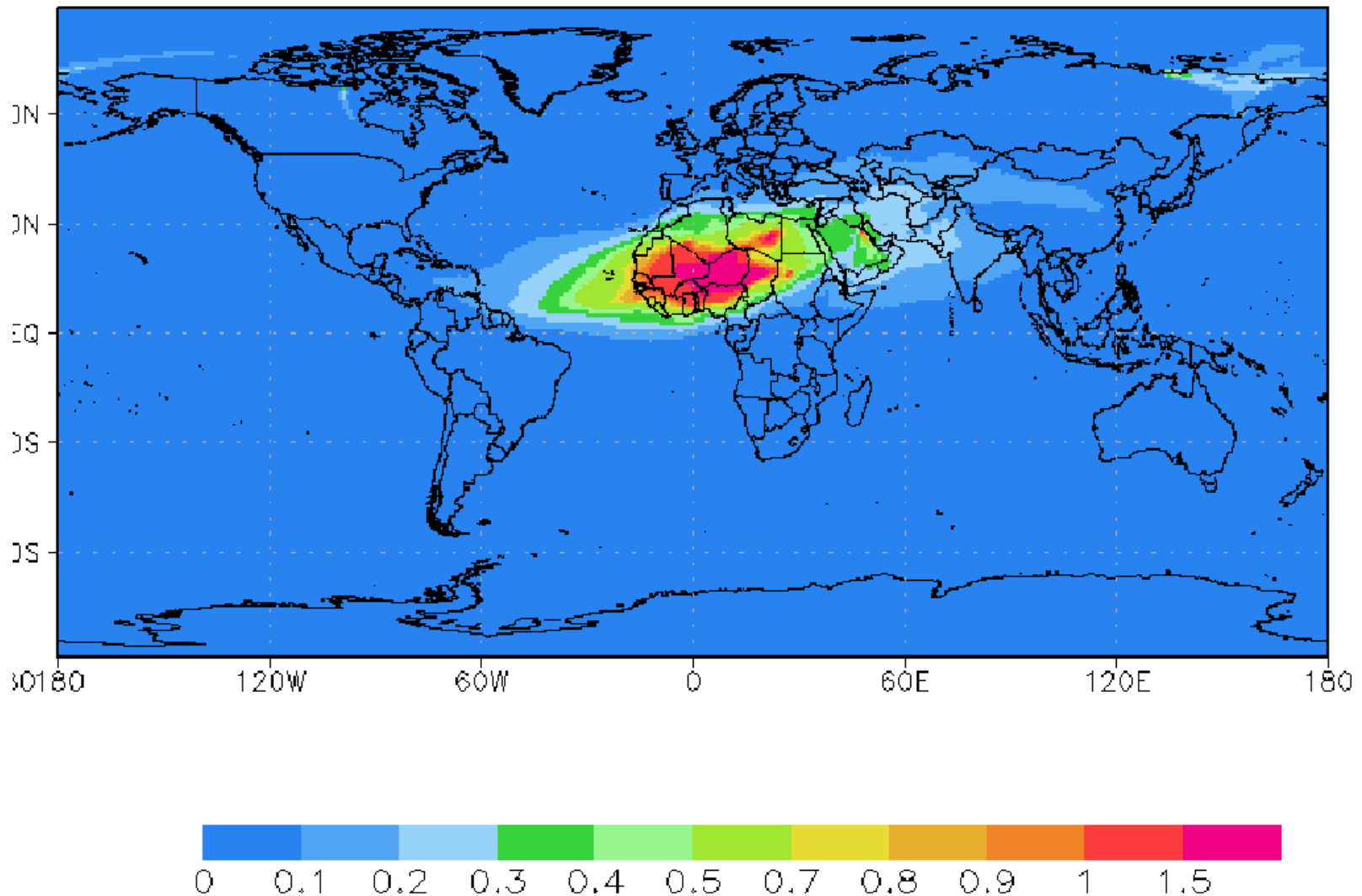
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# First results of SILAM dust module

AODtotal , 2008

Ref15:ERS,ecl,0.042,gust,morphoAlluv,Owen,LAI\_1



# Summary



- Wind-blown dust is the most-powerful source of mineral matter in the atmosphere
- It is also among the most-tricky source terms to model
  - many processes involved
  - poorly known and widely varying parameters
  - threshold-based emission, followed by 3-rd power of the wind speed growth of the emitted mass