Monitoring dune celerities and sand flux by optical cross-correlation

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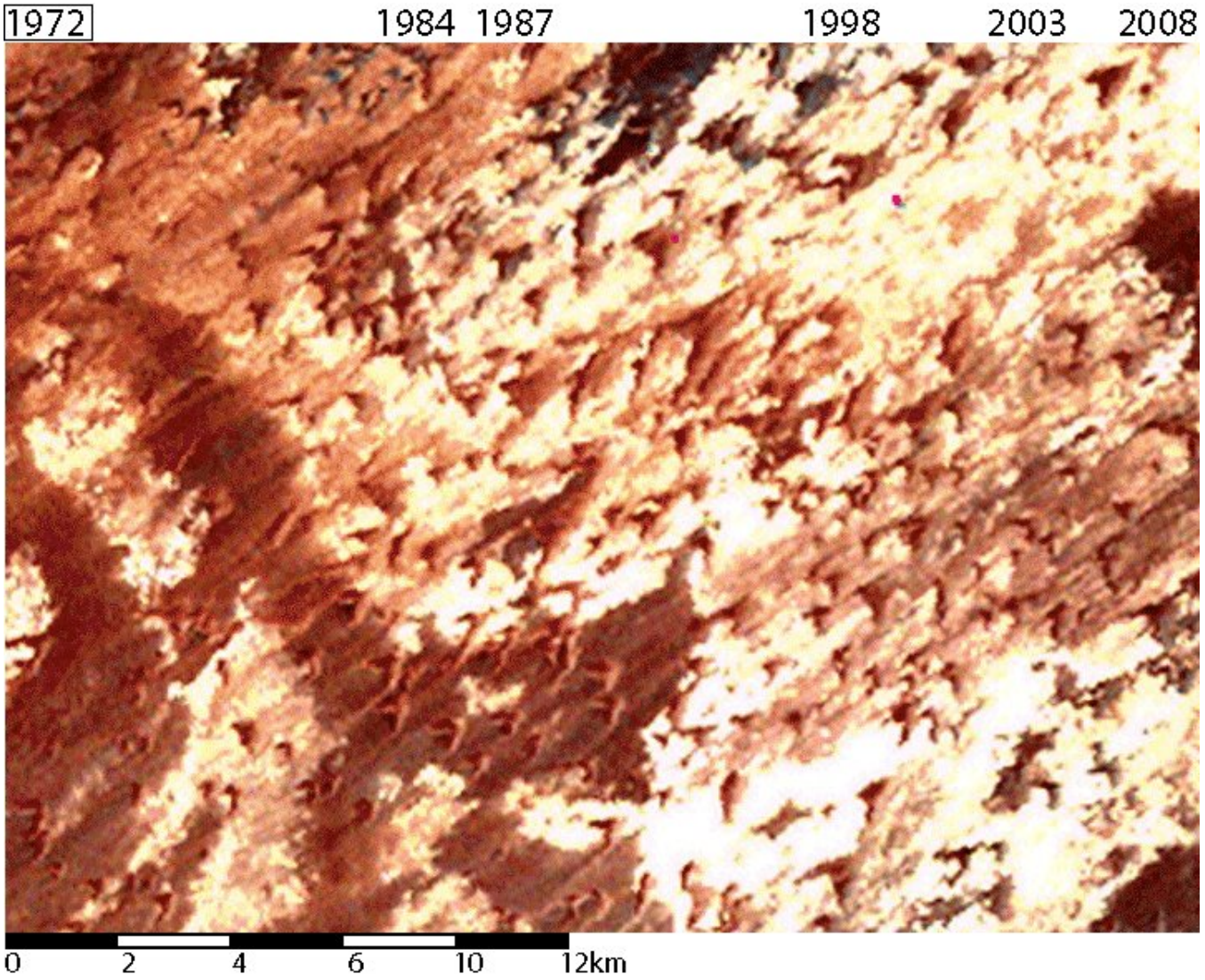
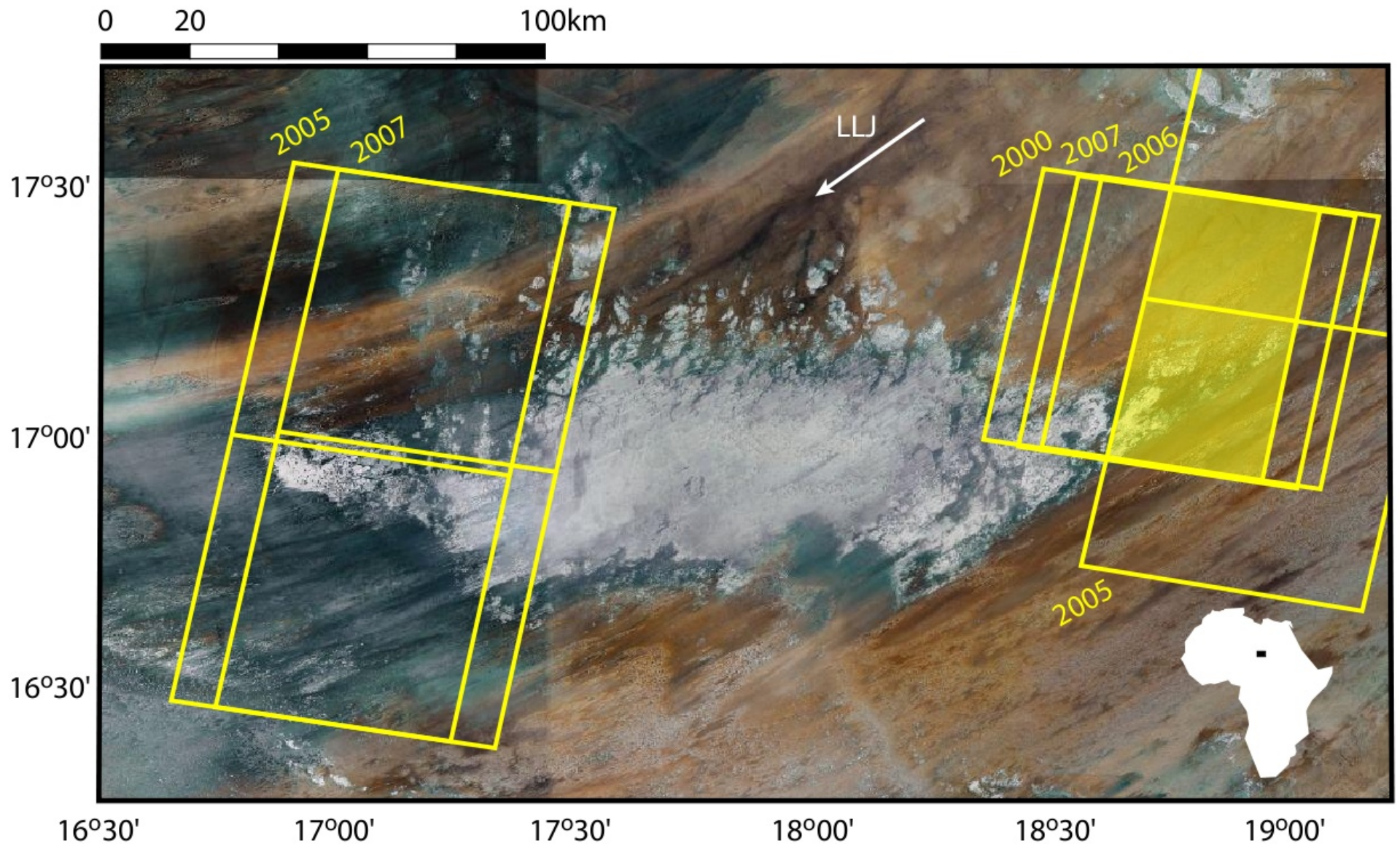
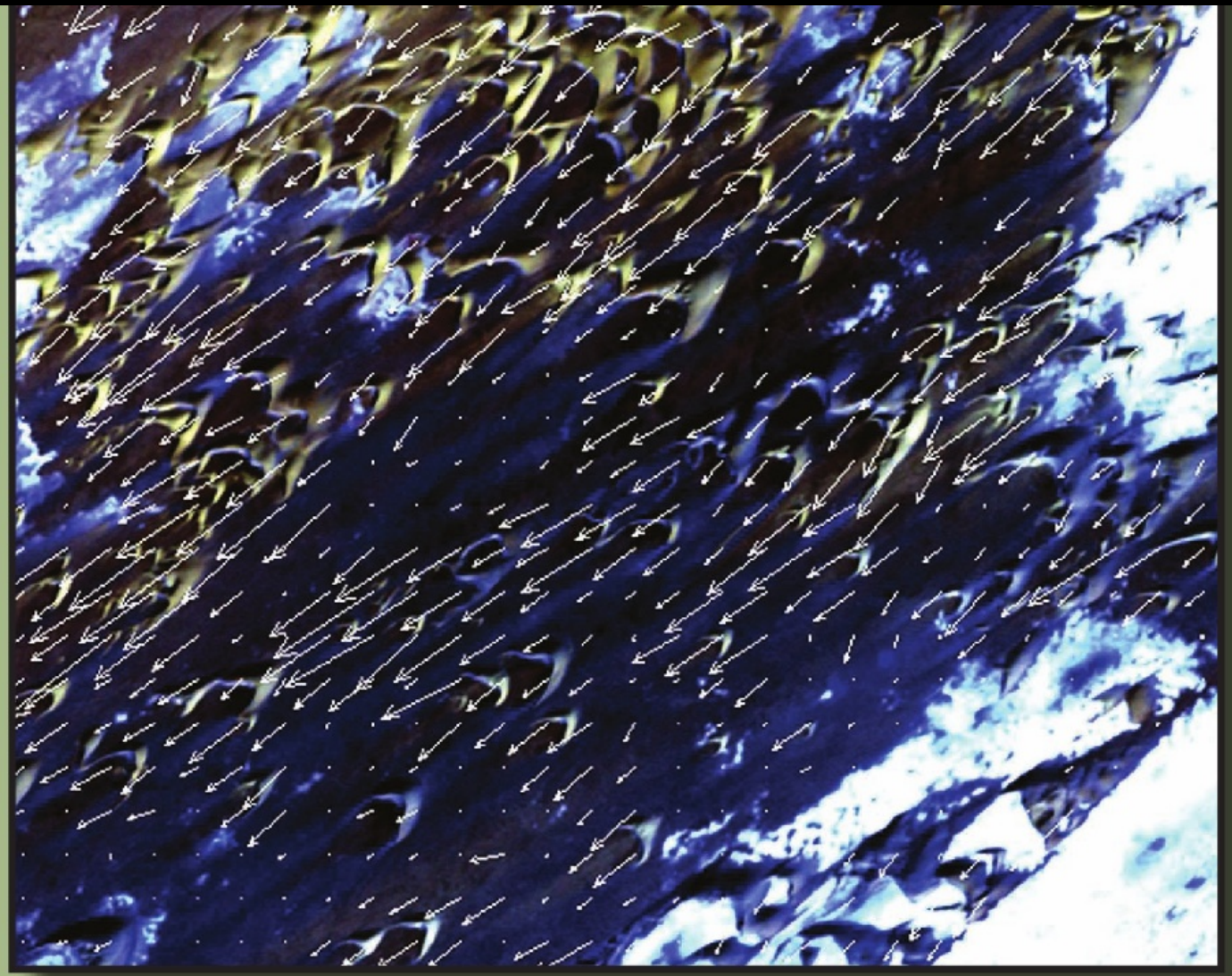
Bodele depression, Chad



animation requires Acrobat Reader 5 or above)


0
20
100km
2005
2007
LLJ
2000
2007
2006
2005
17°30'
17°00'
16°30'
16°30'
17°00'
17°30'
18°00'
18°30'
19°00'



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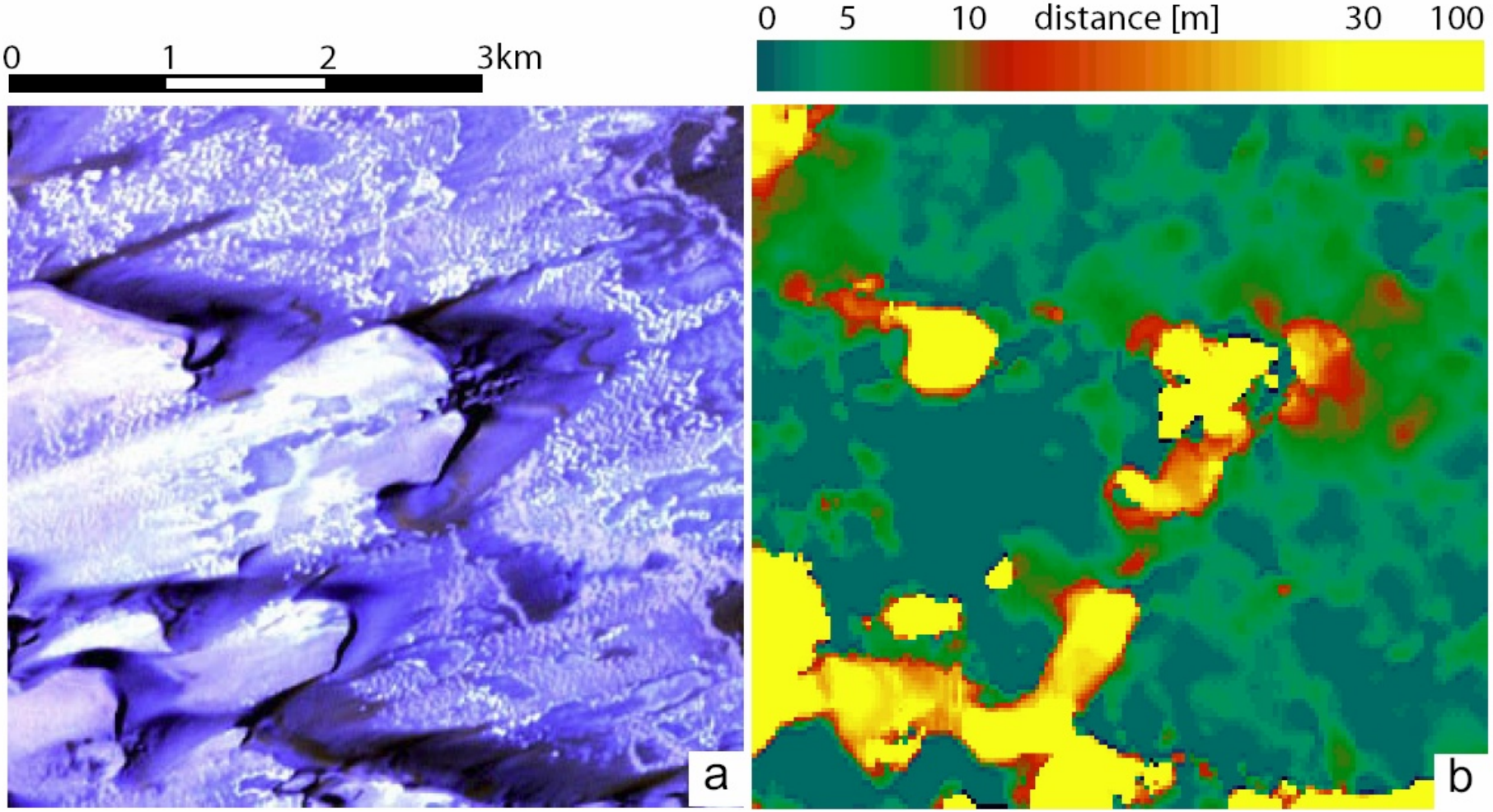
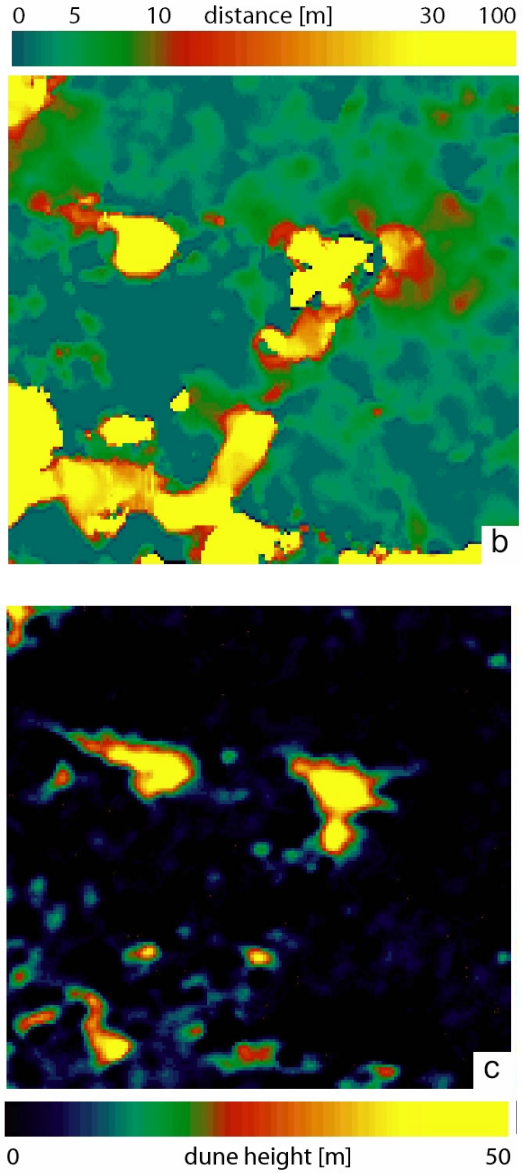
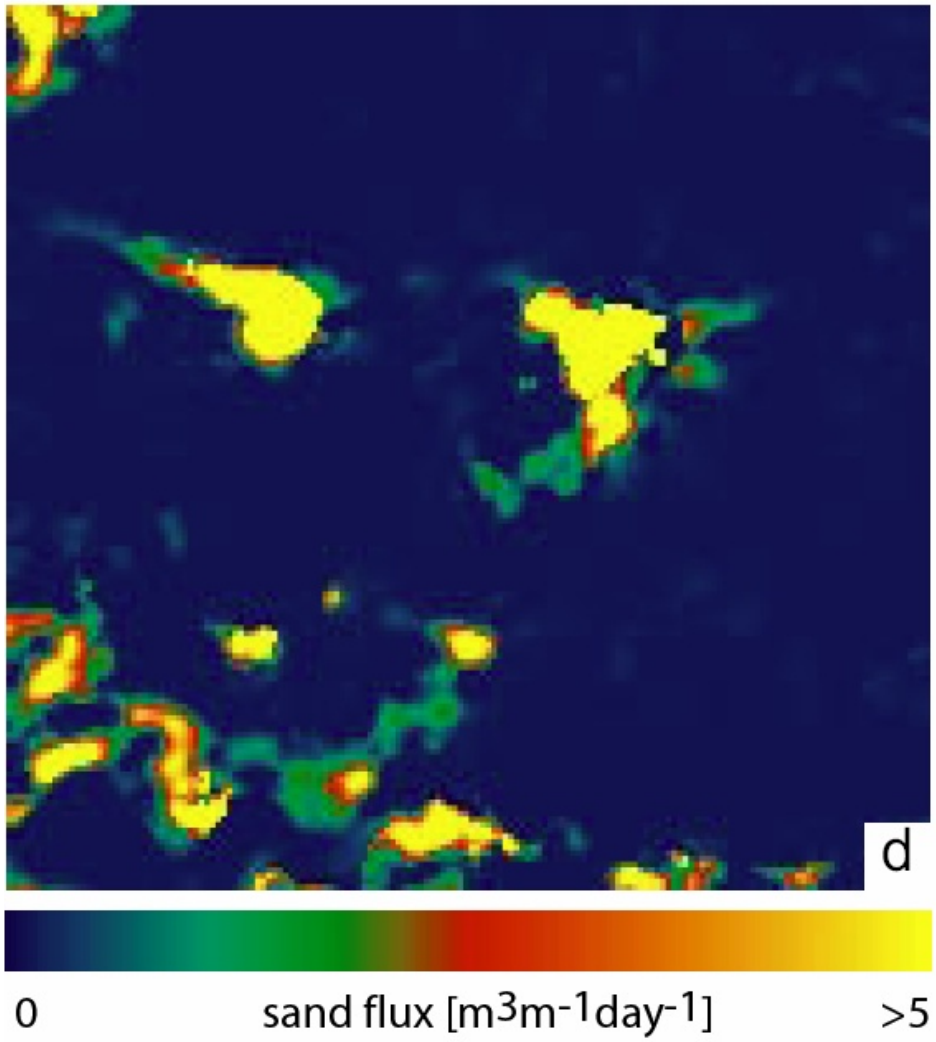
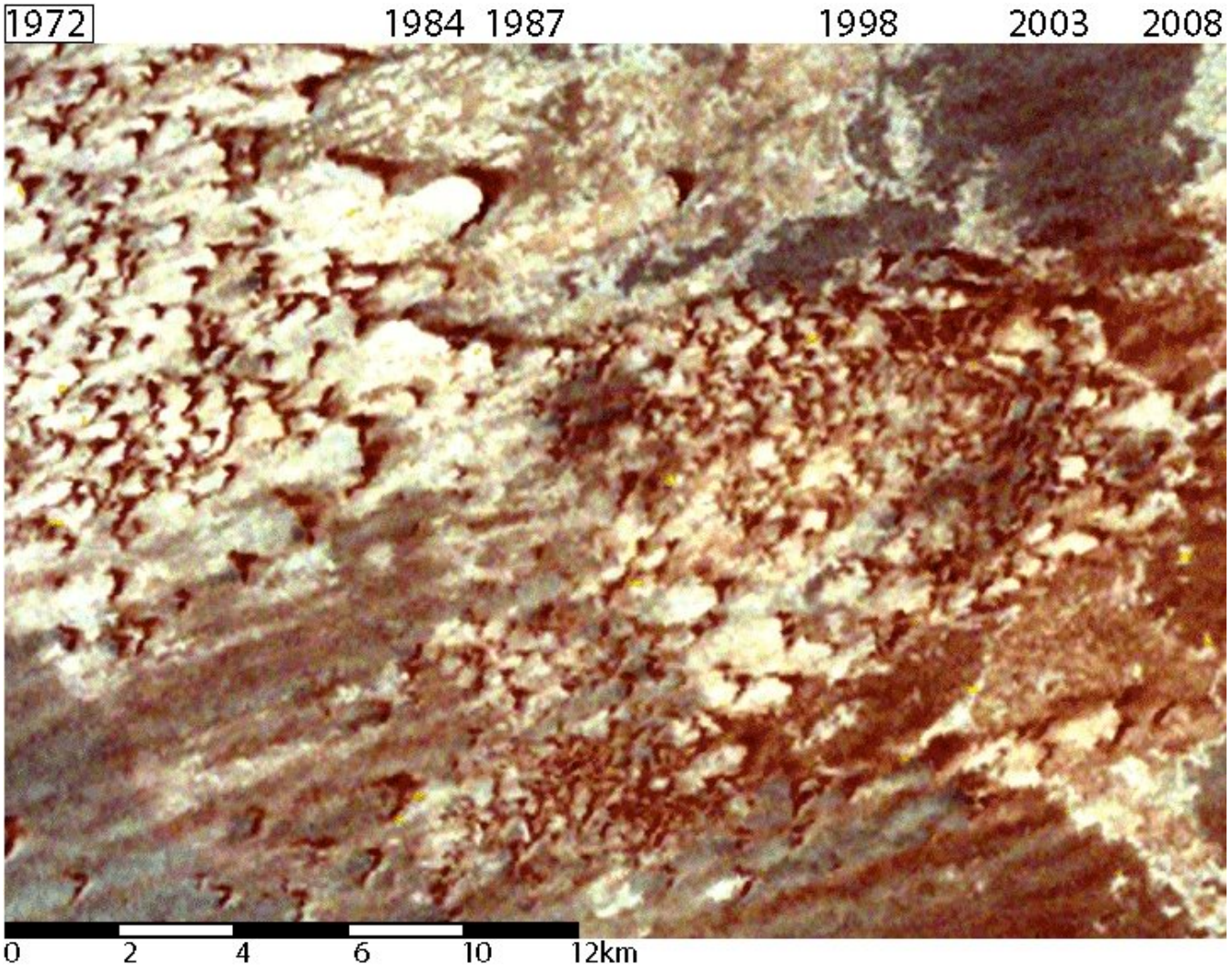
• Tracking the world's fastest moving dunes • How does dust influence regional climate models for West Africa? • Sizes of raindrops affect the creation of tornados in thunderstorms


0
1
2
3km
0
5
10
distance [m]
30
100
a
b

Flux = height x celerity: pixel-by-pixel sand flux estimates

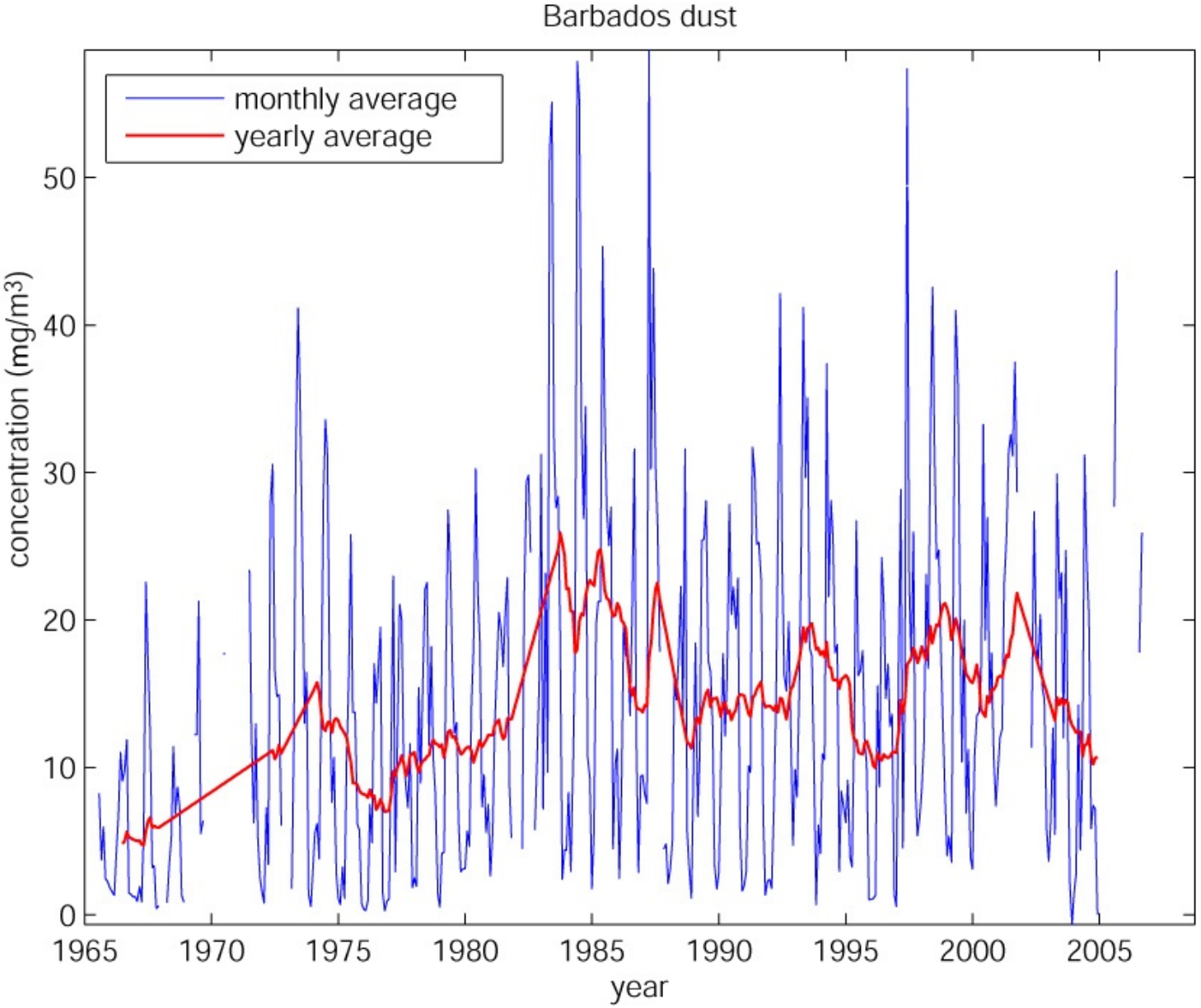




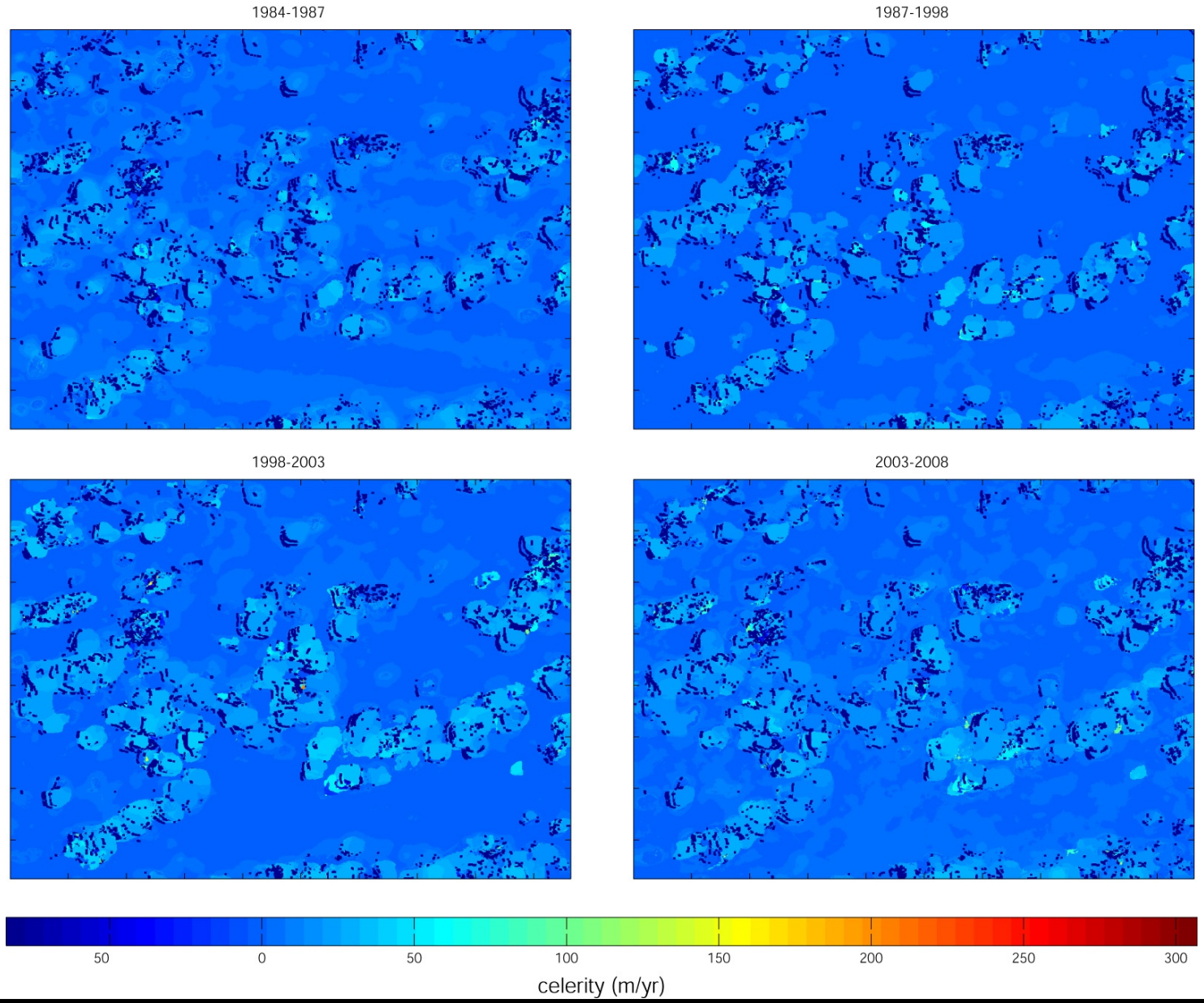


(animation requires Acrobat Reader 5 or above)

Barbados aeolian dust data (provided by J. Prospero)

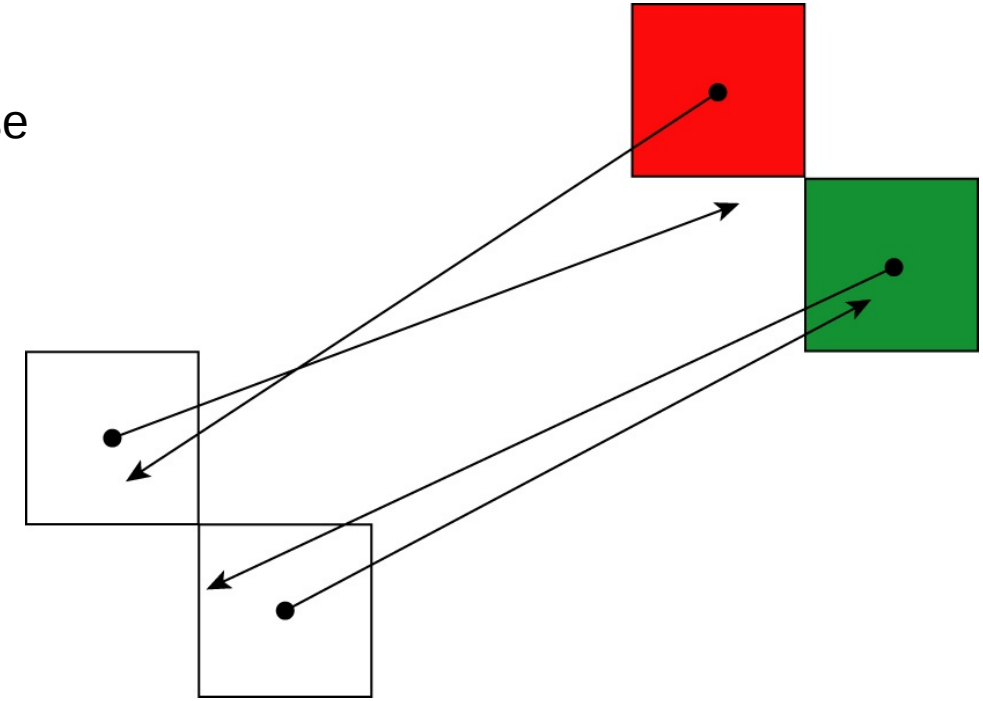


Dune celerities 1984-2008

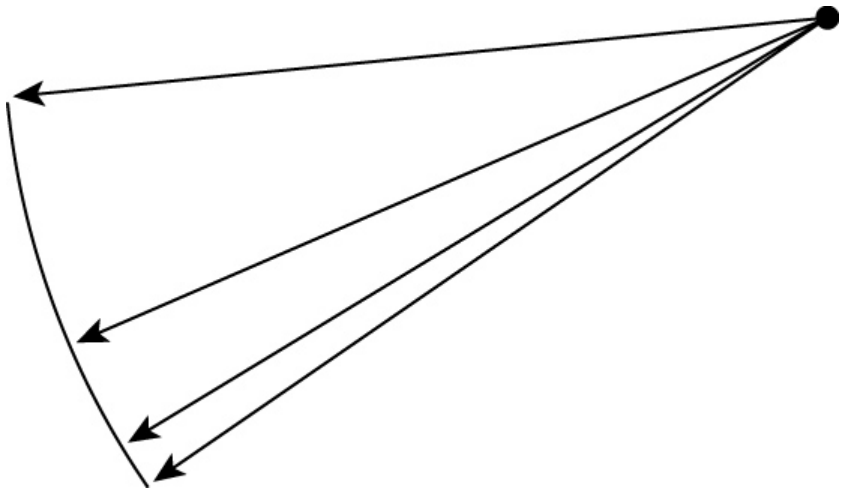


1. Signal-to-noise

2. Consistency

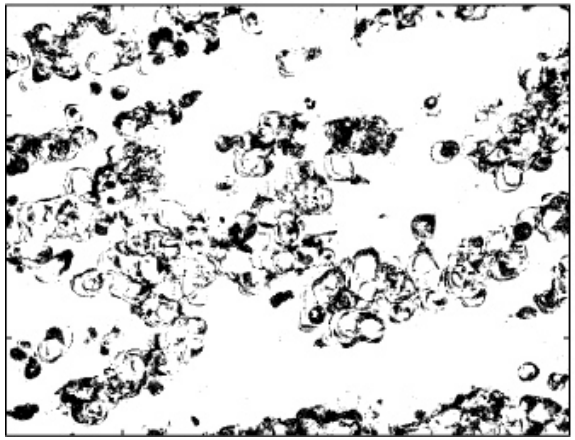


3. Direction



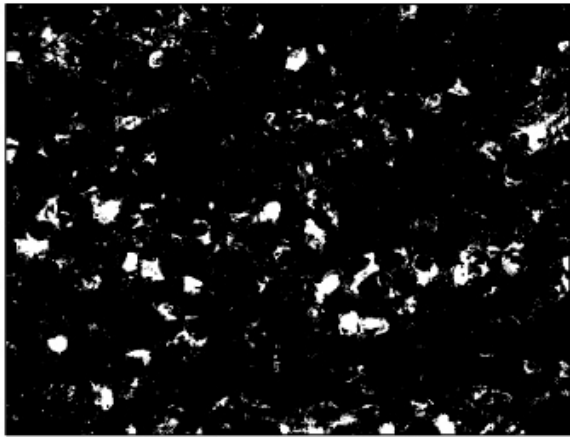
Filters [2]

SNR filter

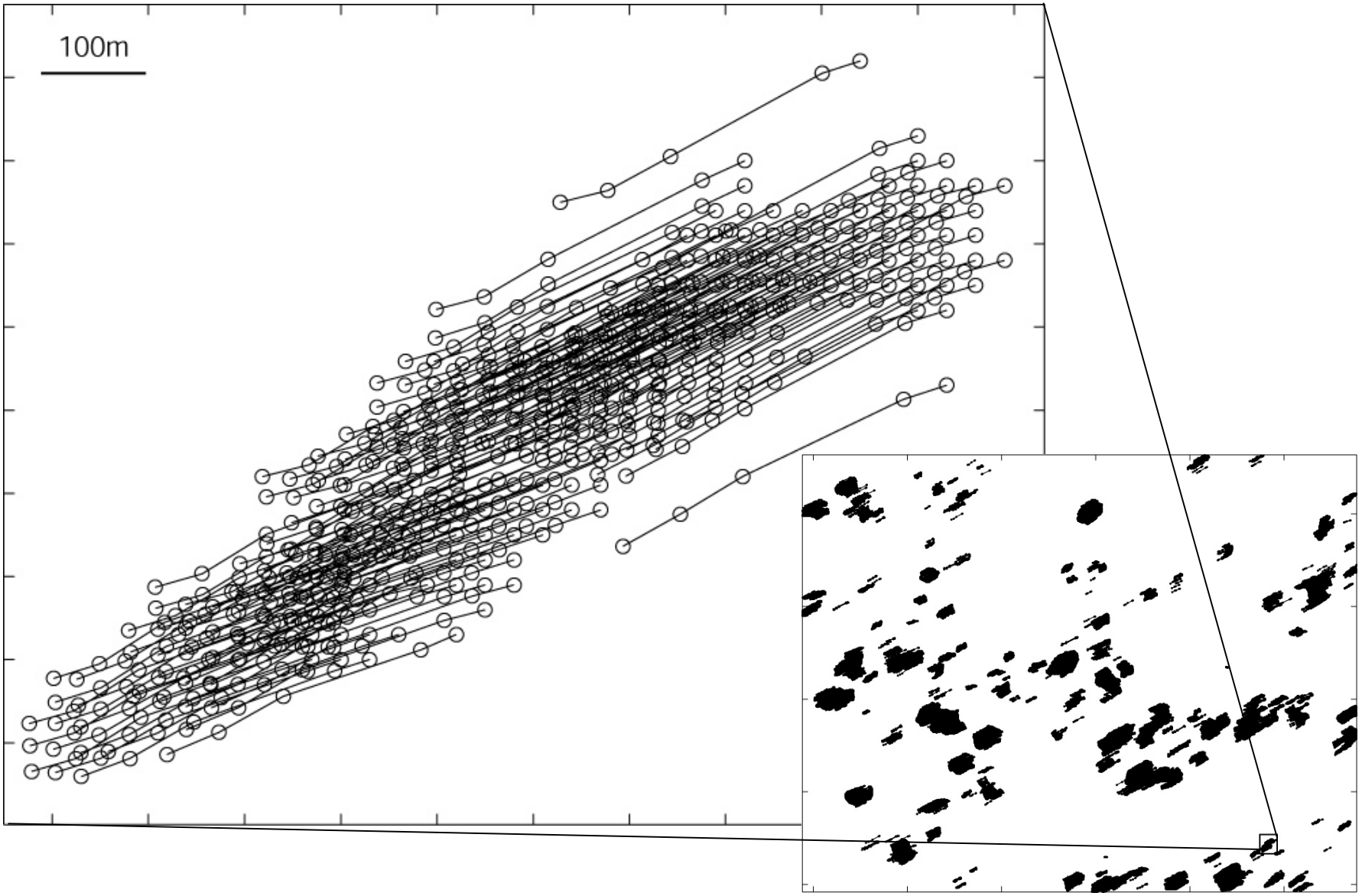


consistency filter

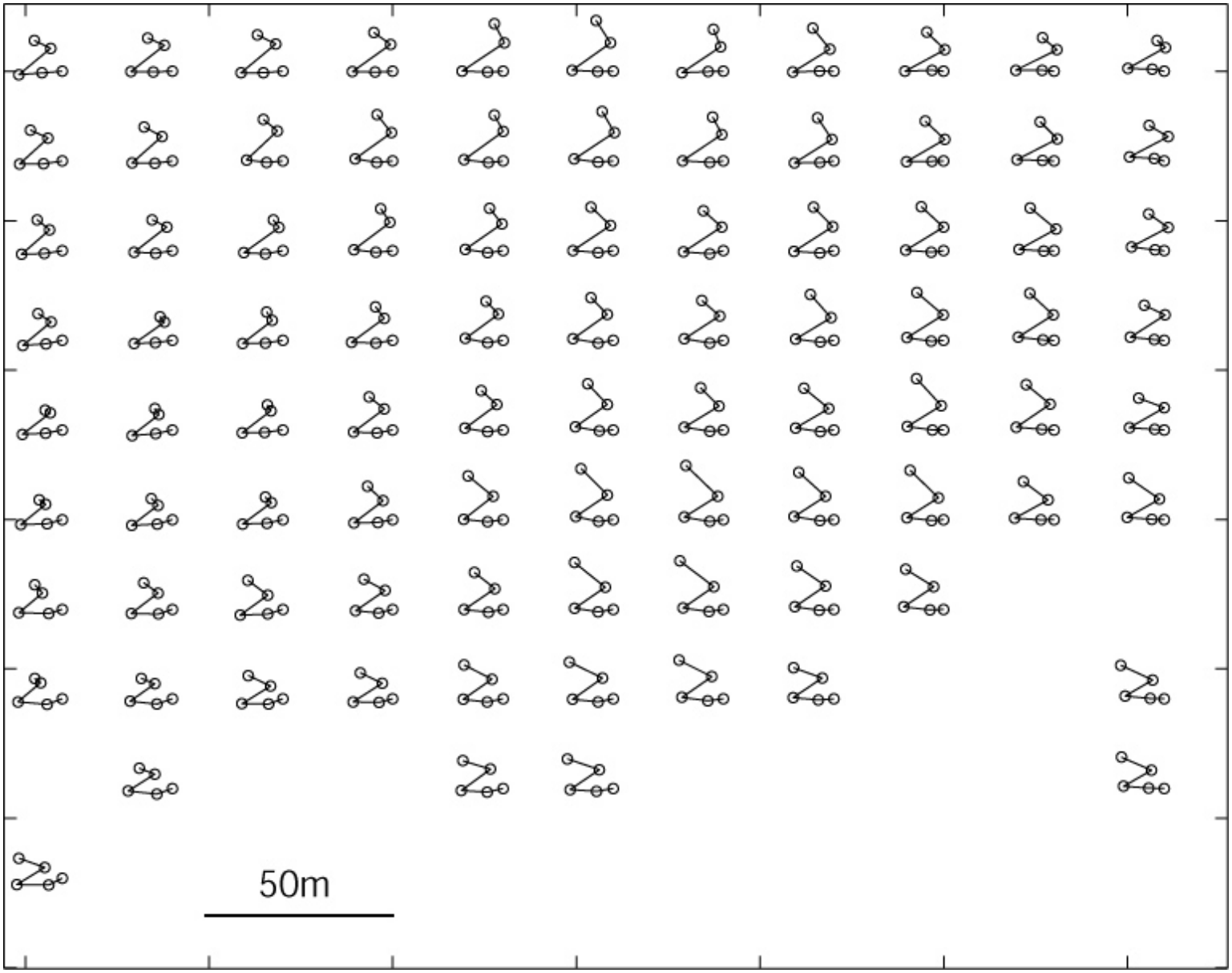
directional filter



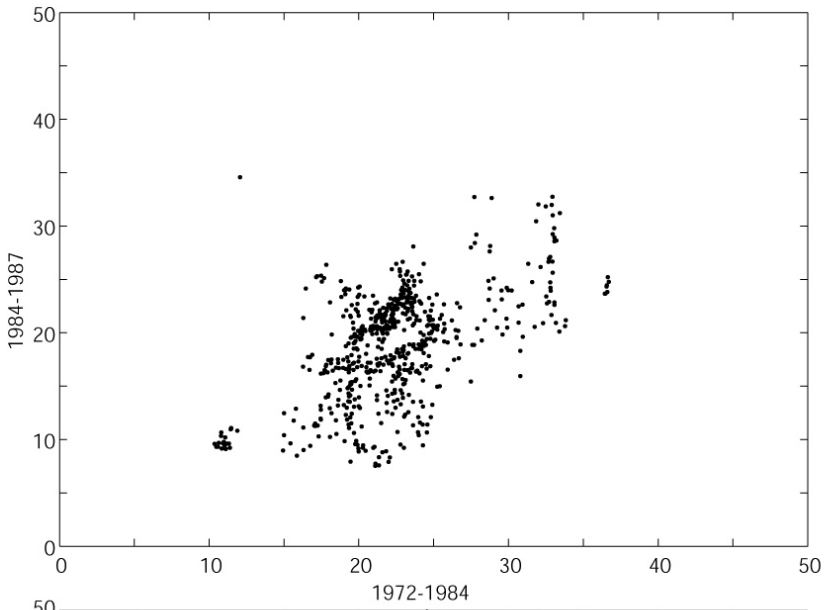
Cumulative dune displacements from 1984 to 2008

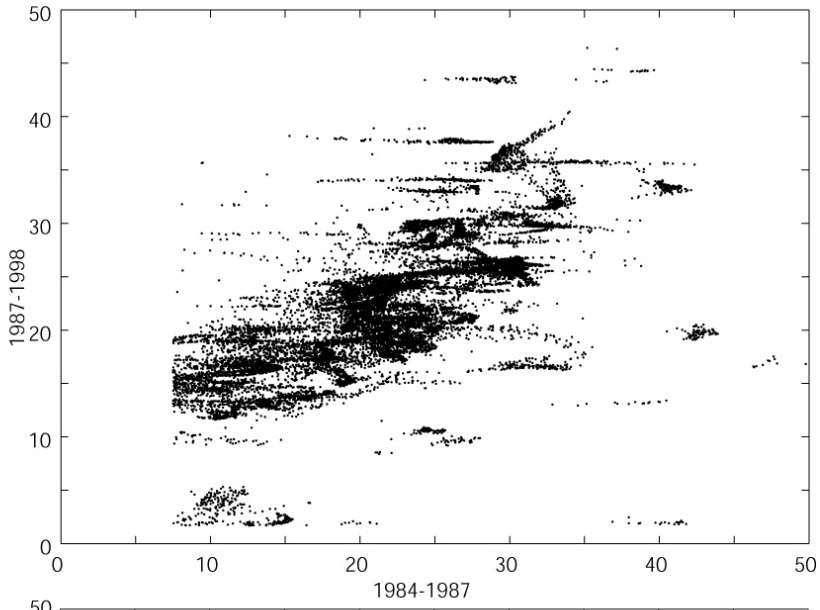


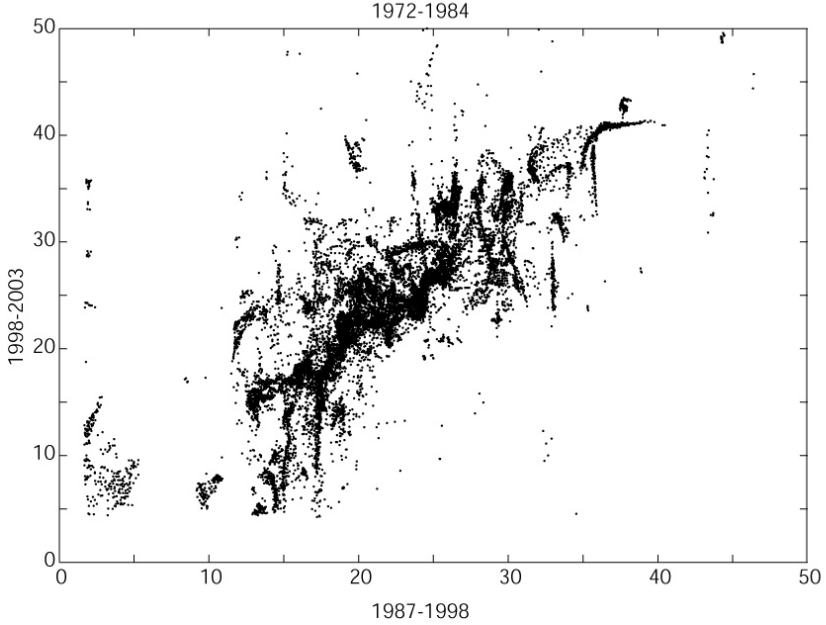
Cumulative interdune displacements from 1984 to 2008

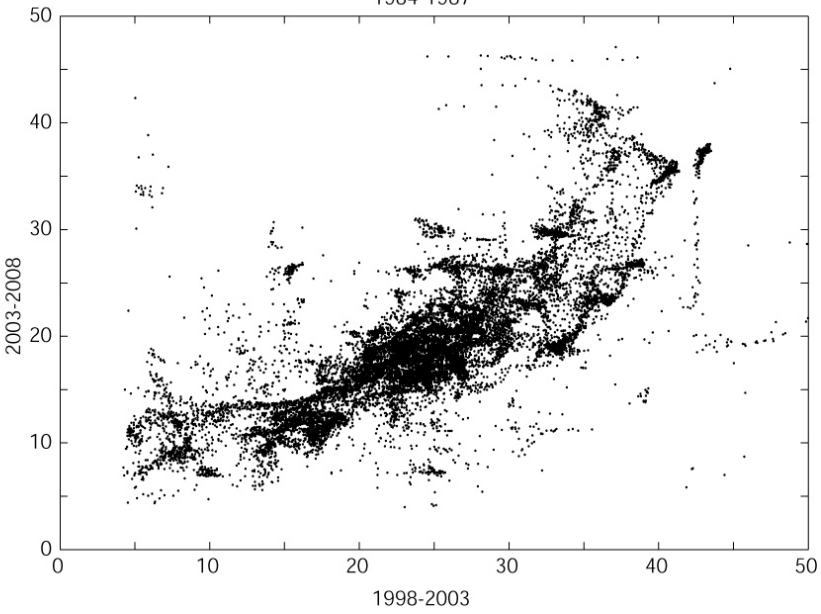


Scatterplot of dune celerities per image pair (x & y in m/yr)

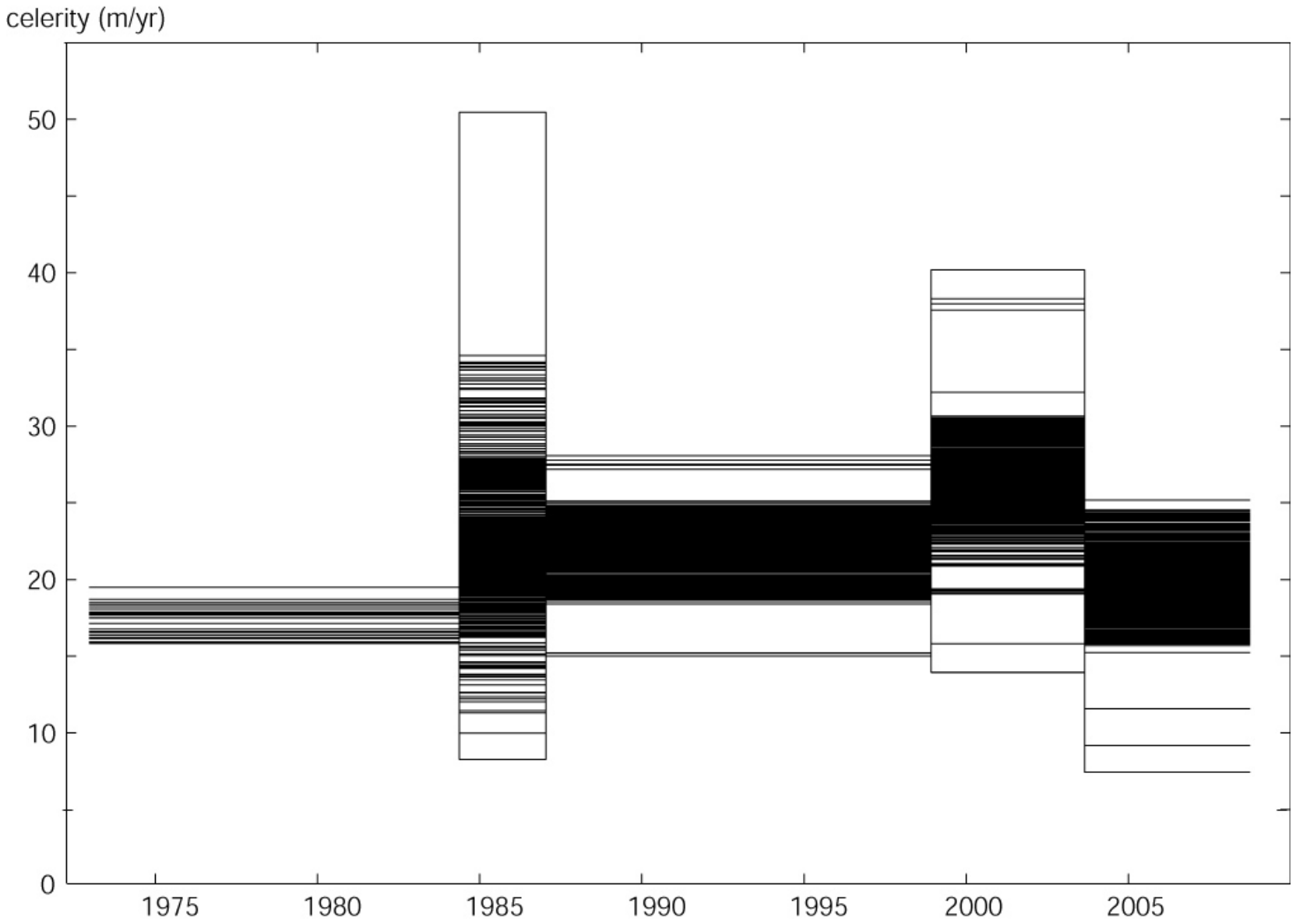








Dune celerities from 1972-2008



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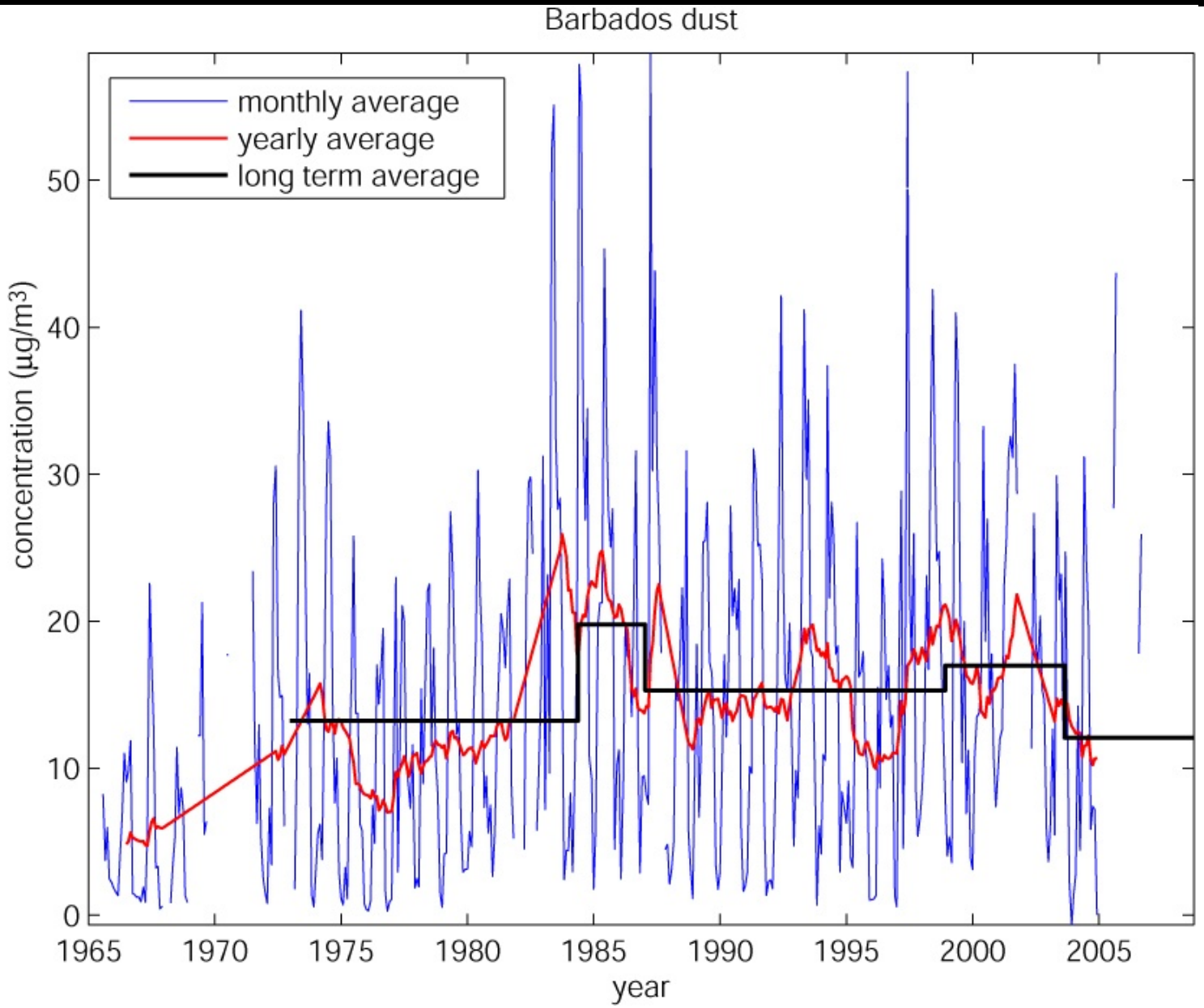

1. Apply *a posteriori* correction to the displacement field

2. Landsat → Corona, SPOT, ...

3. Take on larger areas with a 'distributed telescope'