

Tsunami deposits: Tasks for hydrodynamists towards more reliable tsunami hindcast

by

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Indonesia - Banda Aceh Subset 2

1 : 10.000

IKONOS - January 10, 2003 - PRE-DISASTER IMAGE

IKONOS - December 29, 2004 - POST-DISASTER IMAGE



Center for Satellite based Crisis Information
- Emergency Mapping & Disaster Monitoring -

German Remote Sensing Data Center
German Aerospace Center

Legend

- IKONOS - Subsets
- Damaged Area
- Coastline before Tsunami

Scale

0 200 400 600 800 m

1 : 10.000

Projection: UTM Zone 49 N
Spheroid: WGS84
Datum: WGS 84

Data Source

IKONOS imagery provided through

CRISP
National University of Singapore

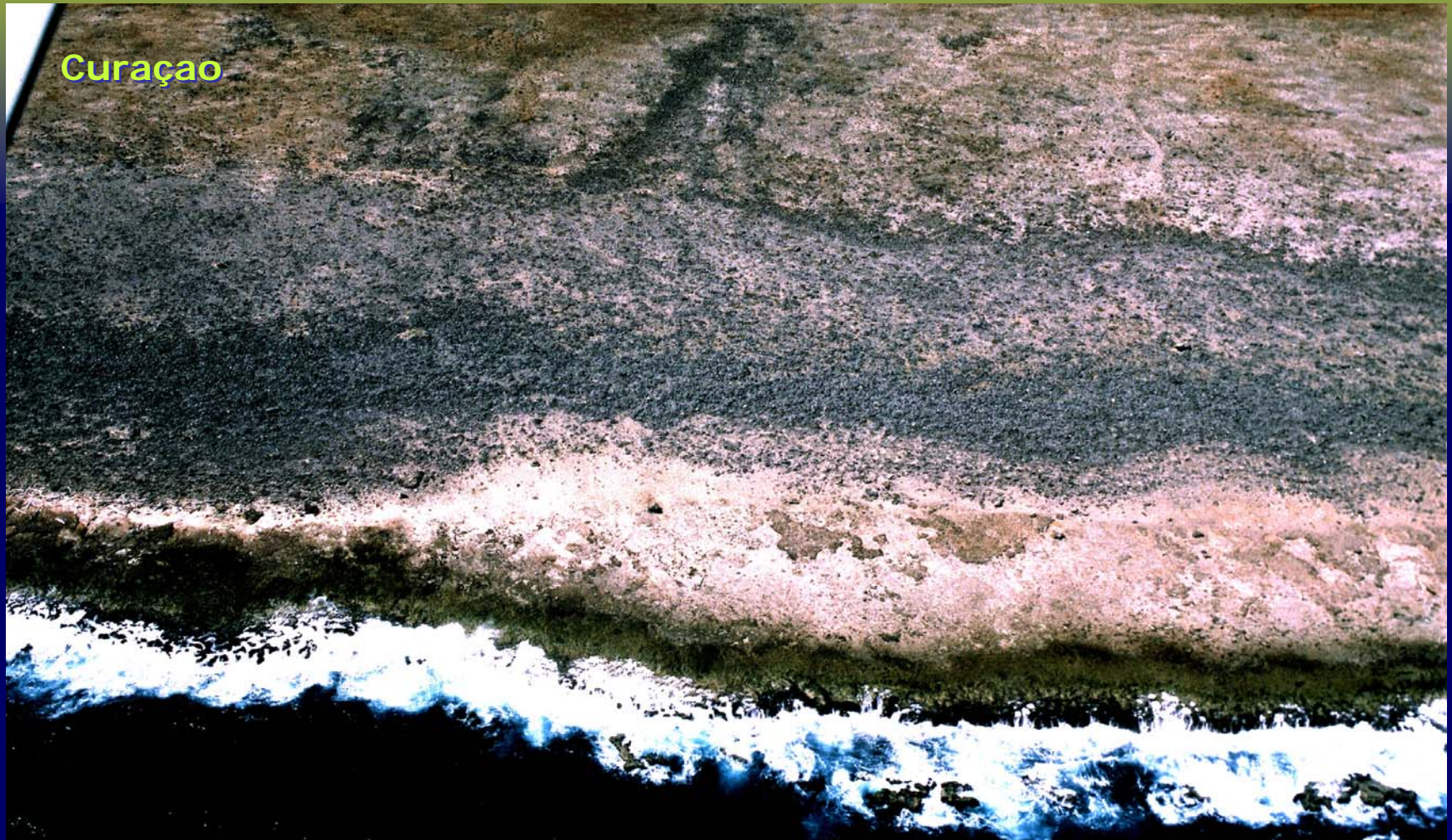
SPACE IMAGING
Visual Information. Visible Results.

Map created December 30, 2004 by ZK@DLR.DE
updated January 4, 2004 (Version 03)









Curaçao









Unstable settings



Imbrication trains



Eleuthera, Bahamas









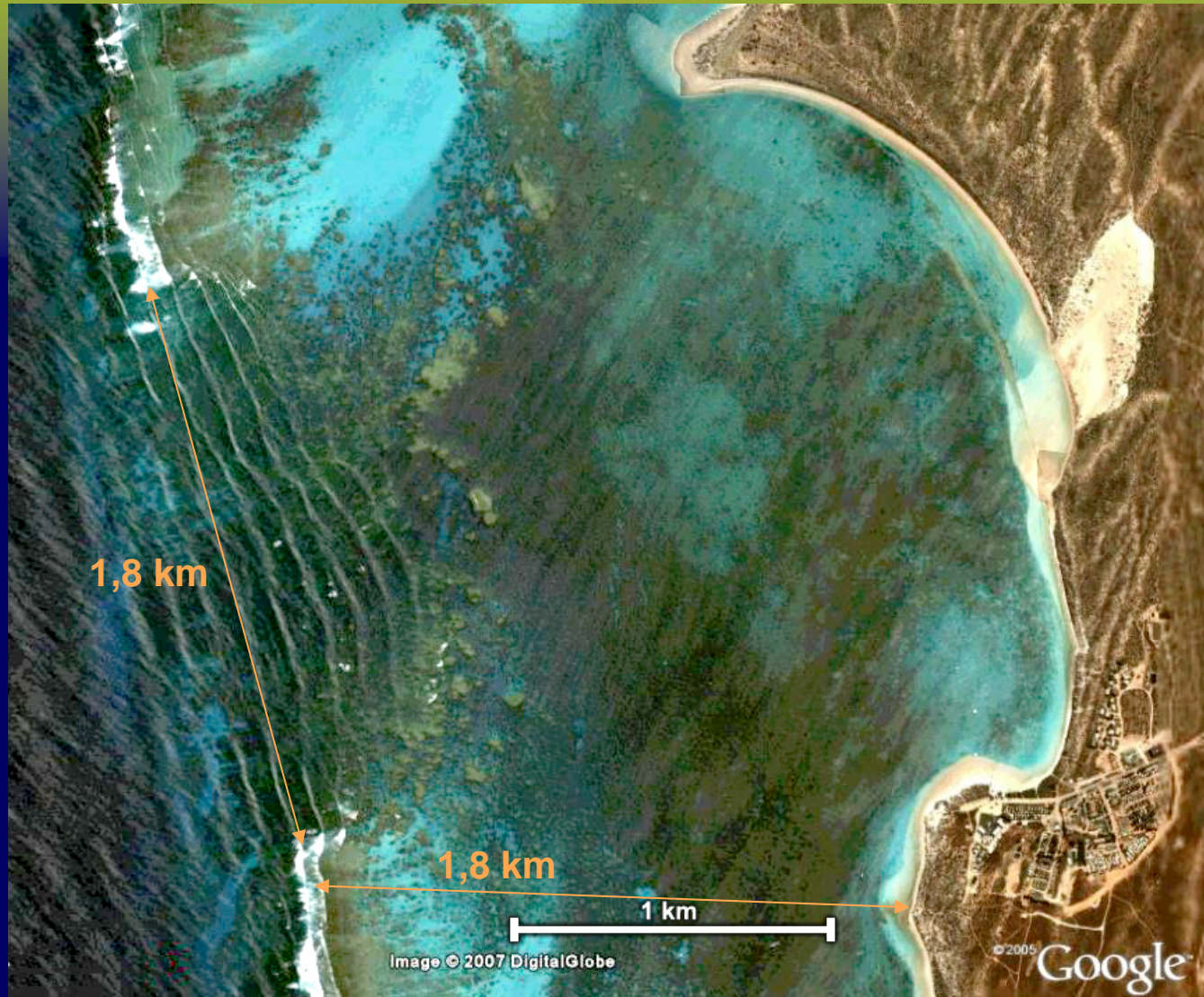












Problem:

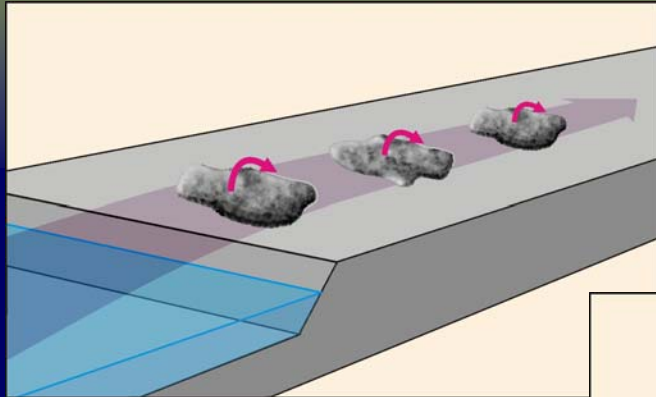
reconstruction of wave heights passing the shoreline
or transporting boulders, calculated from inundation
width and transport of fine sediments

Which wave heights and wave velocities have been occurred for the movement of boulders of more than 200 t or even 2000 t ?

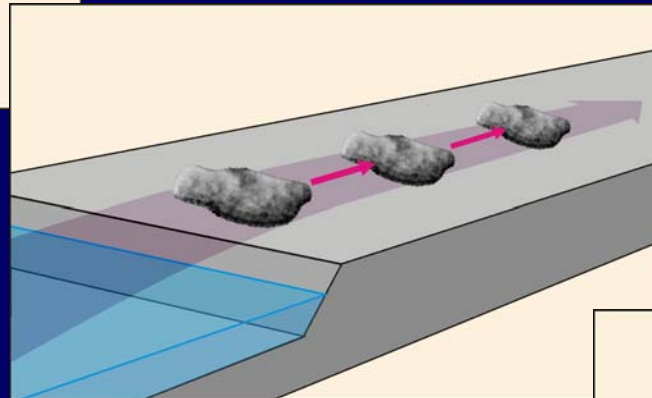
Objective observations show:

No rolling along the longest axis (= no abrasion!), but movement in a water column/water torrent without touching the ground, than smashing down, partly with breakage into several pieces.

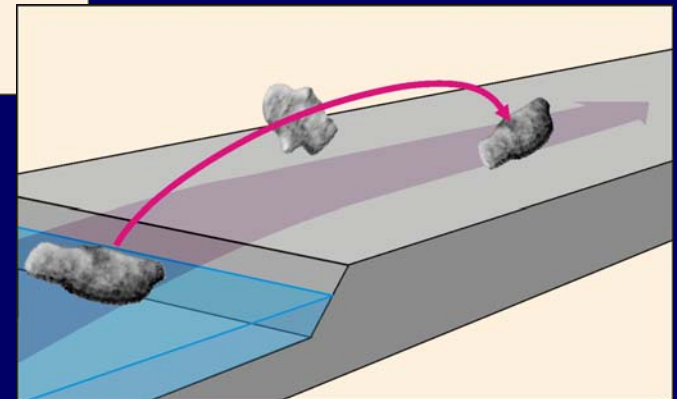
Kind of Movement



Rolling around
long axis



Pushing forward,
step by step



In water torrent
without touching
the ground

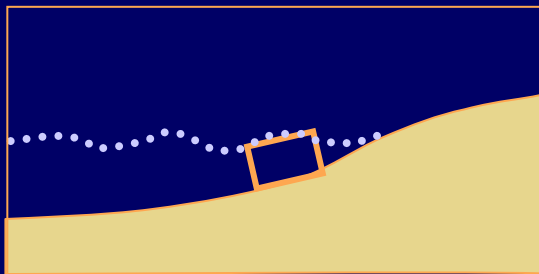
A high and strong storm wave may have a velocity of
 $8 \text{ m/s} = 29 \text{ km/h} = \text{hydrodyn. force of } 3000 \text{ kg or } 3 \text{ t/m}^2$

In case of a cube of $2 \times 2 \times 2 \text{ m} = 8 \text{ m}^3 = 20 \text{ t}$

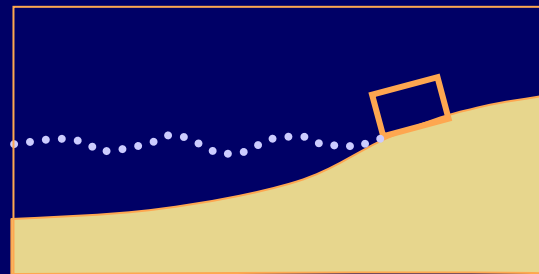
a force of 12000 kg will push the boulder (as a maximum, if in the right position):

This is too less for a movevement if the boulder is in subaerial position, but may work if the boulder is submerged (= rel. weight of only 12 t) – if there is no friction, no slope etc.

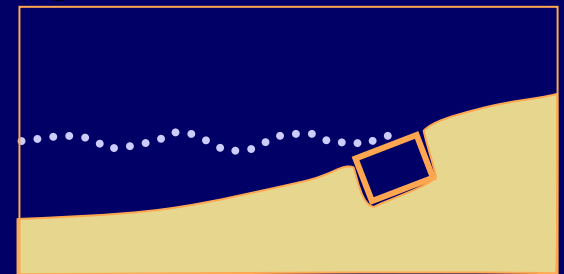
submerged



subaerial



joint bounded



Tsunami wave velocity

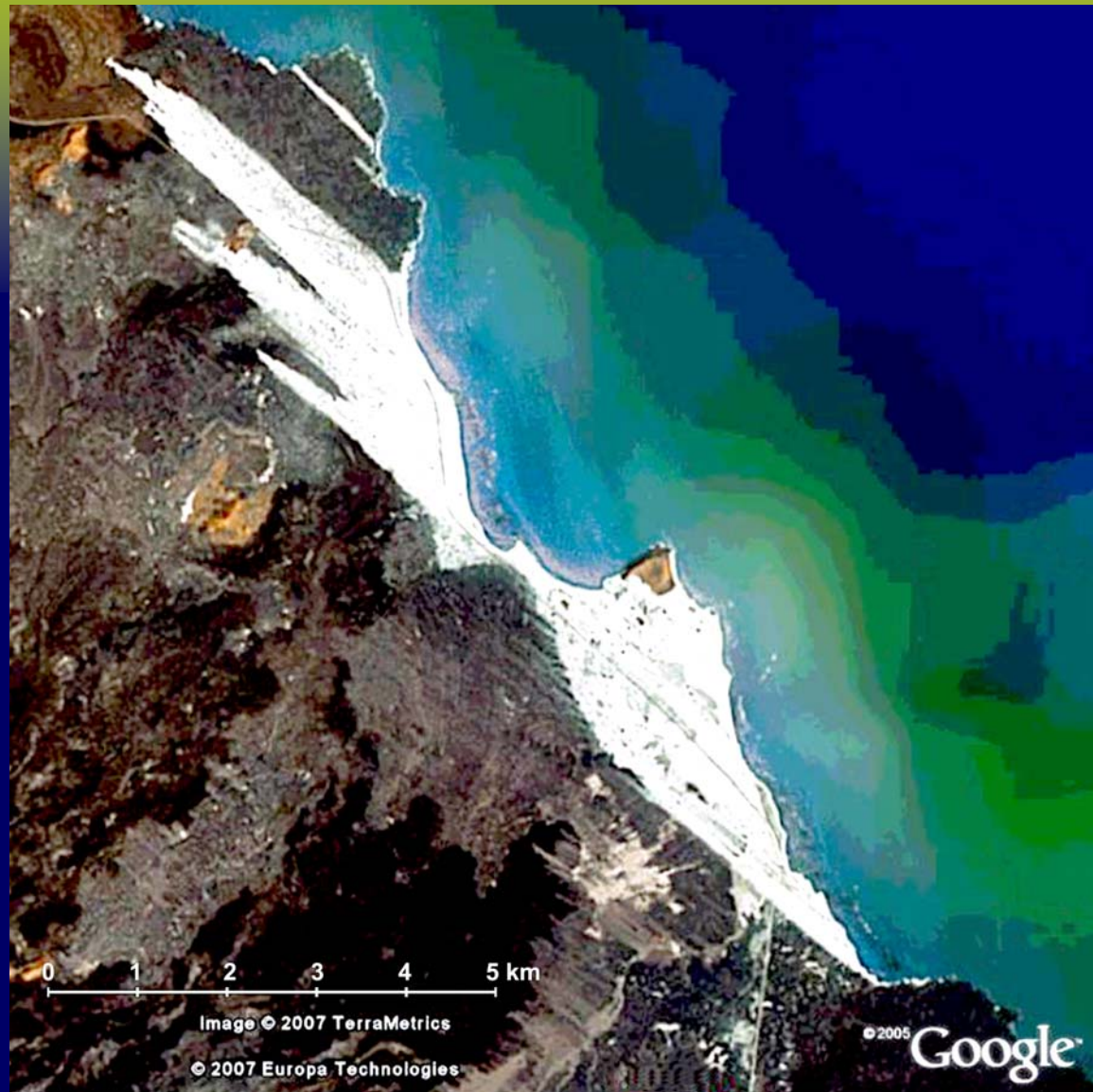
16 m/s = 60 km/h = hydrodyn. force/m² = 6000 kg = 6 t

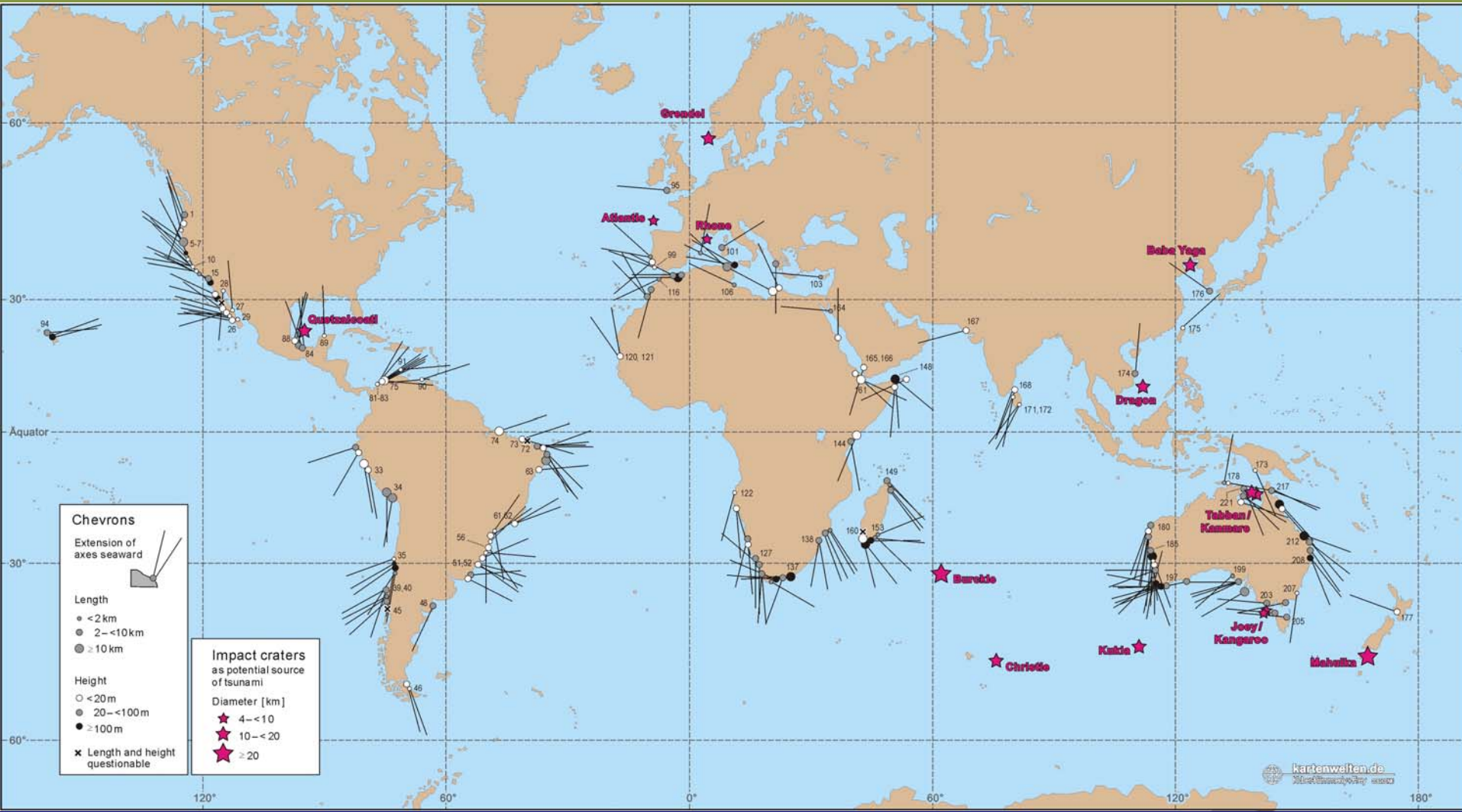
A cube of **3 × 3 × 3 m = 27 m³ = 70 t**

will get a hydrodynamic force of **54 t on 9 m²** as a maximum.

If submerged a weight of only 43 t has to be moved/lifted:
possible, but close to the limit !







Registrierte Tsunami-Häufigkeit

run up-Höhen (>10 m) seit 1600 AD

- ca. 10/a sind an Pegeln messbar.
- Tsunami mit Menschenopfern und 5-10 m run up etwa alle 3-5 a.
- Run up von 50-100 m etwa alle 100 a.

