Constraining tsunami source—Inverse modeling of velocities and inferred cause of overwash that emplaced inland fields of boulders at Anegada, British Virgin Islands


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Site description

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Possible overwash sources

North America Plate

~ 3,300 km to M 9.0 Lisbon eq.

M 8.0 outer-rise eq.

M 8.7 thrust eq.

Puerto Rico

Anegada

Caribbean Plate

0 125 250 km
Numerical modeling results

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Field measurements of boulders

Boulder wt (kilograms)

- 1.43 - 10.00
- 10.01 - 25.00
- 25.01 - 50.00
- 50.01 - 100.00
- 100.01 - 250.00
- 250.01 - 500.00
- 500.01 - 774.68

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Forces
- Drag force, $F_D$
- Inertia force, $F_I$
- Lift force, $F_L$
- Gravitational force, $F_g$

Forces formulations
- $F_D = 0.5 \rho_f C_D A_N u^2$
- $F_I = \rho_f C_M V \dot{u}$
- $F_L = 0.5 \rho_f C_L A_L u^2$
- $F_g = (\rho_s - \rho_f) V g$

For sliding:
- $F_D + F_I > \mu_s (F_g - F_L)$
Calculated flow speed

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Boulder constraints on tsunami source

Calculated flow speed for transport of largest boulders

Speed from numeric hydrodynamic models