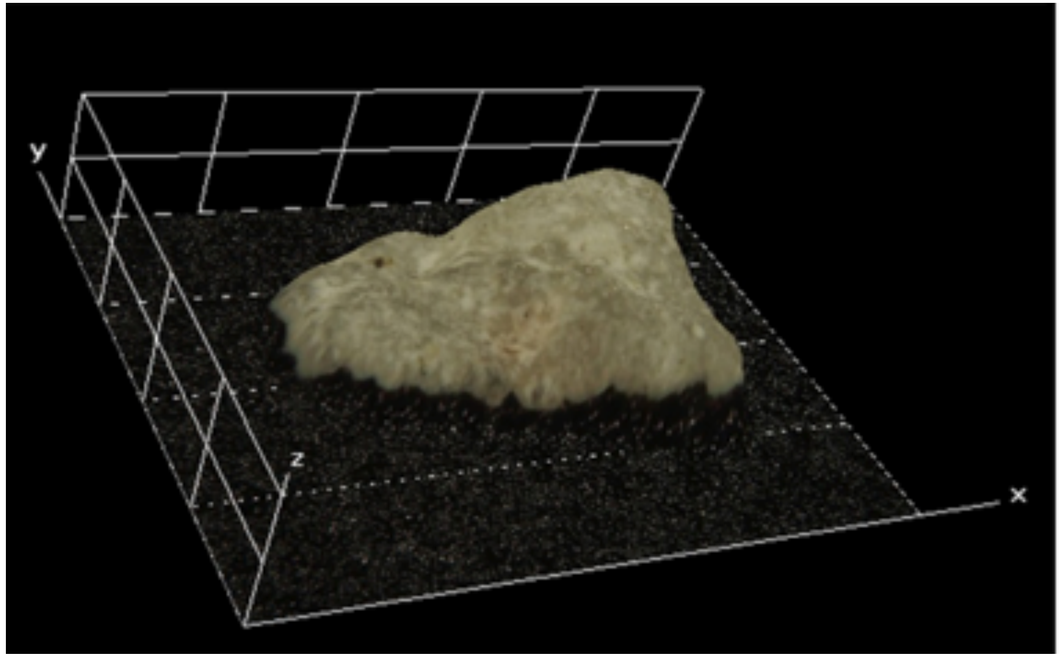
Better physics for coastal dynamics

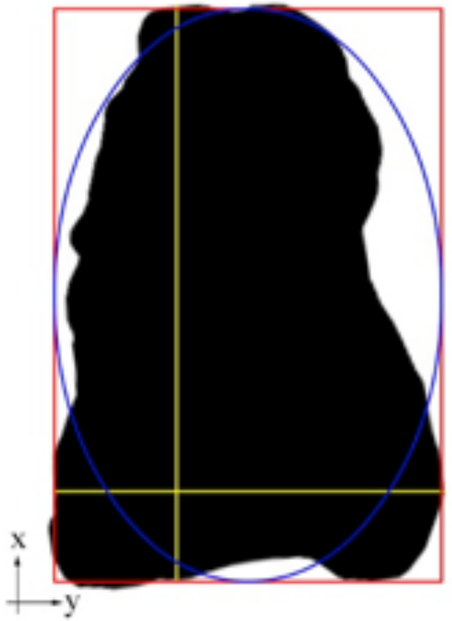
Sediment transport

And what about carbonate sands ???

The unique particle characteristics of calcareous sands is due to carbonate mineralogy that distinguishes them from silica sands

While the hydraulic properties such as settling velocity of silica sands in form of quartz have been studied extensively, yet the understanding of **calcareous sands settling behaviour is limited**!





A 3D scan of a calcareous particle with its longest, intermediate, and the shortest mutually perpendicular axes from Heron island.

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For calcareous sand from this study

$$C_D = \left(\frac{a_3 \nu}{d_n^{1.5}\sqrt{g}} + a_4\right)^{a_5} + \left(\frac{a_6 \nu}{d_n^{1.5}\sqrt{g}} + a_7\right)^{a_8}$$

$$\omega^2 = \alpha \frac{4}{3} \frac{(S-1)g}{C_D} S_f^{2/3} d_n$$

with

- $\alpha = 0.55$
- $a_3 = 9.5$
- $a_4 = 0.76$
- $a_5 = 2.92$
- $a_6 = 20.47$
- $a_7 = 1.02$
- $a_8 = -48.15$

The following values have been chosen for the different parameters:

- water density $\rho_w = 1024 kg.m^{-3}$
- sediment density $\rho_s = 2600 kg.m^{-3}$
- dynamic viscosity $\mu = 1.002e^{-3}$ in Pa.s at 20 C
- kinematic viscosity $\nu = \mu/\rho_w$
- $S_f = 0.556$

For siliciclastic sand

$$C_D = \left(\frac{a_1 \nu}{d_n^{1.5}\sqrt{g}} + a_2\right)^{a_3}$$

$$\omega^2 = \frac{4}{3} \frac{(S-1)g}{C_D} S_f^{2/3} d_n$$

with

- $a_1 = 96.45 - 74.74 S_f^{-0.113}$
- $a_2 = 1.129 - 0.435 S_f^{1.7}$
- $a_3 = 2.023$

values:

- water density $\rho_w = 1024 kg.m^{-3}$
- sediment density $\rho_s = 2600 kg.m^{-3}$
- dynamic viscosity $\mu = 1.002e^{-3}$ in Pa.s at 20 C
- kinematic viscosity $\nu = \mu/\rho_w$
- $S_f = 0.556$