Adaptive Coastal Management with Geosynthetic Stub Groins, Druif Beach, Aruba

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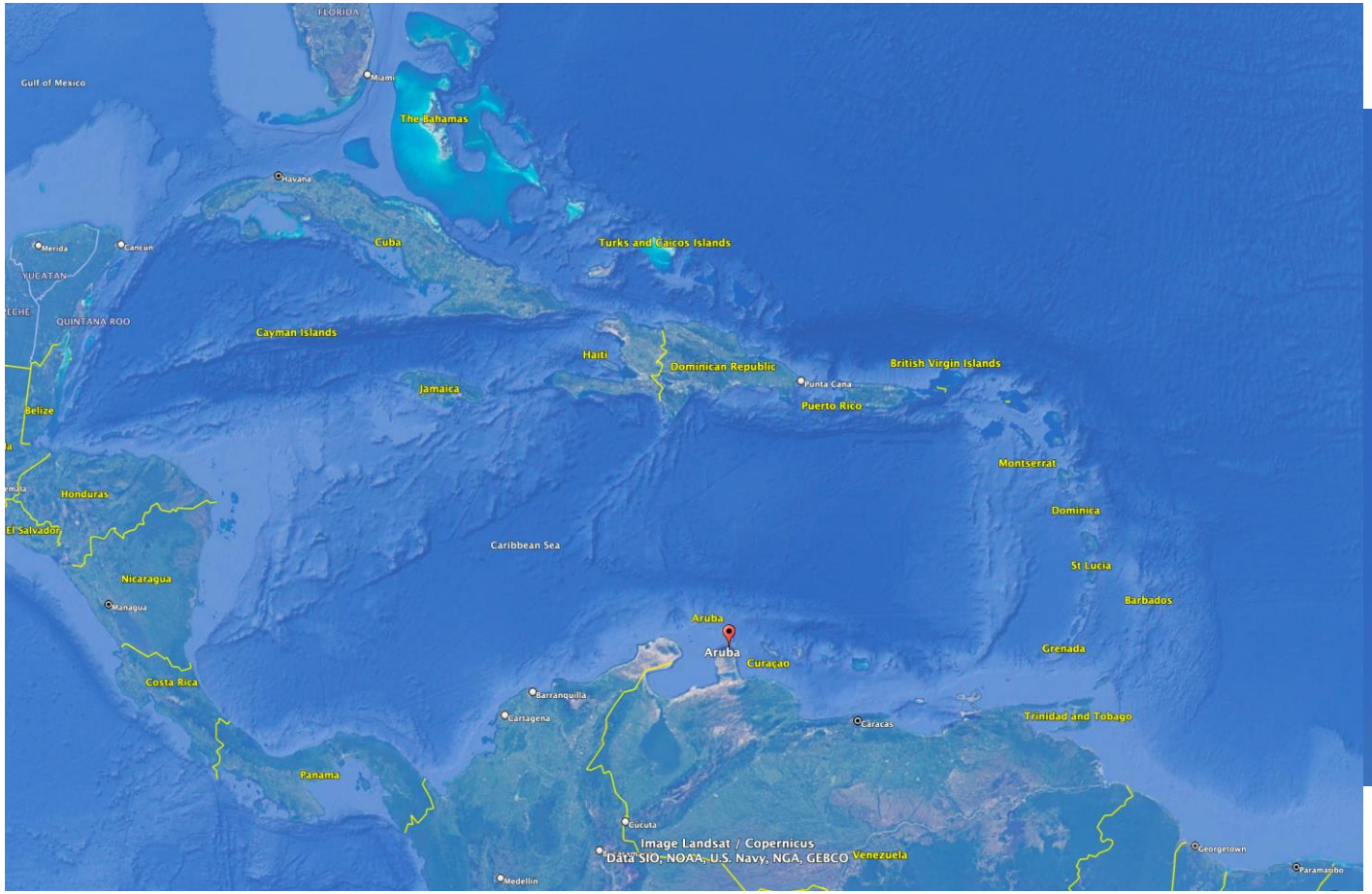
Little Environments PLLC


FLORIDA
Gulf of Mexico
Miami
The Bahamas
Havana
Cuba
Turks and Caicos Islands
Merida
Cancun
YUCATAN
QUINTANA ROO
Cayman Islands
Haiti
Dominican Republic
Punta Cana
British Virgin Islands
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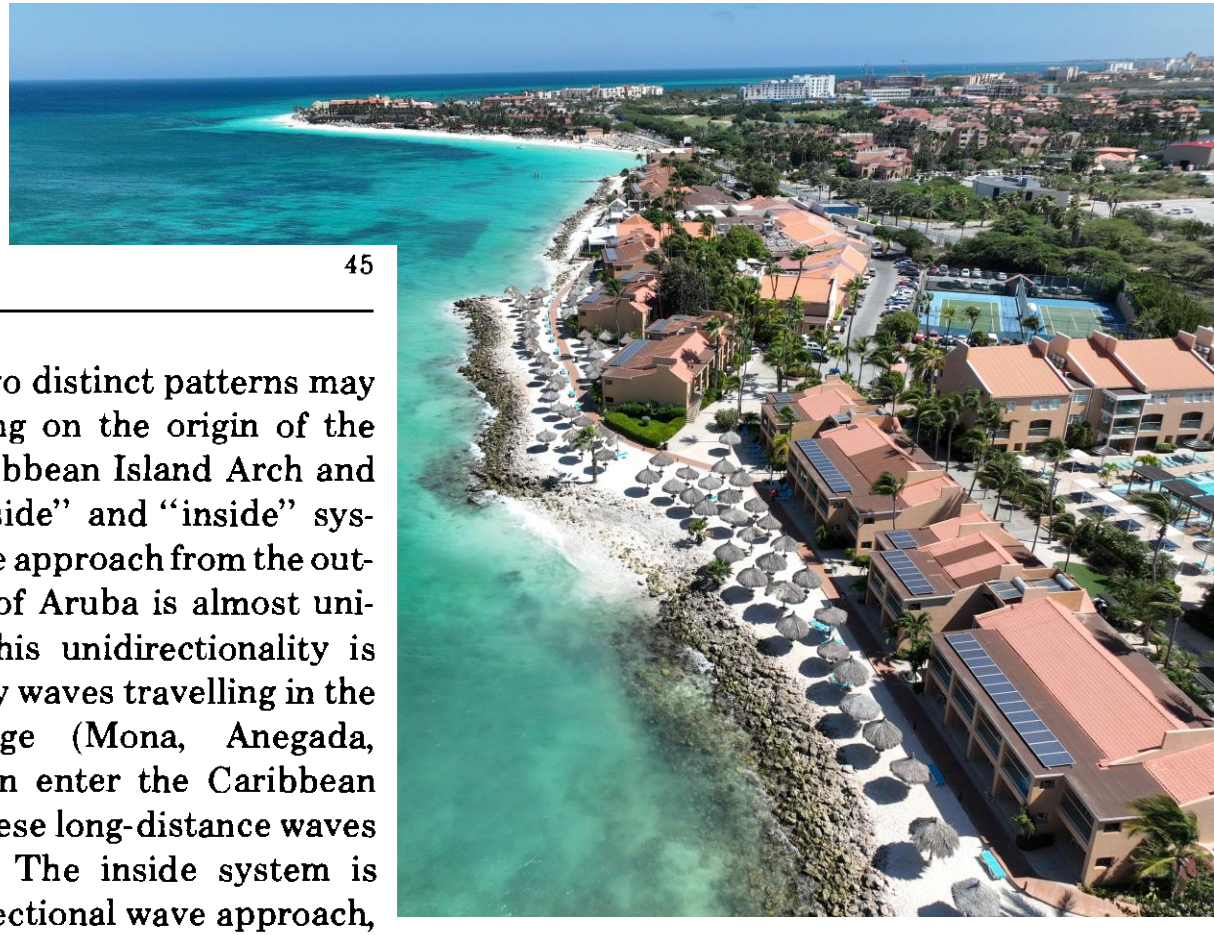
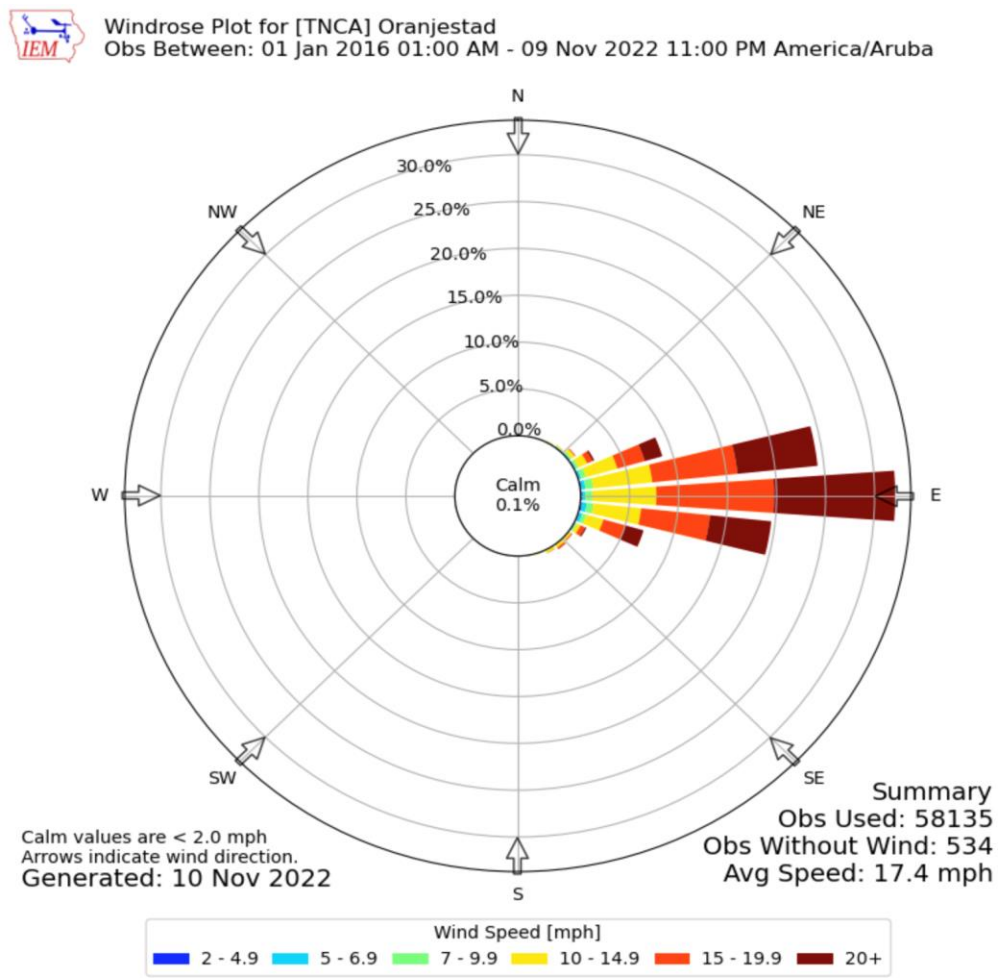


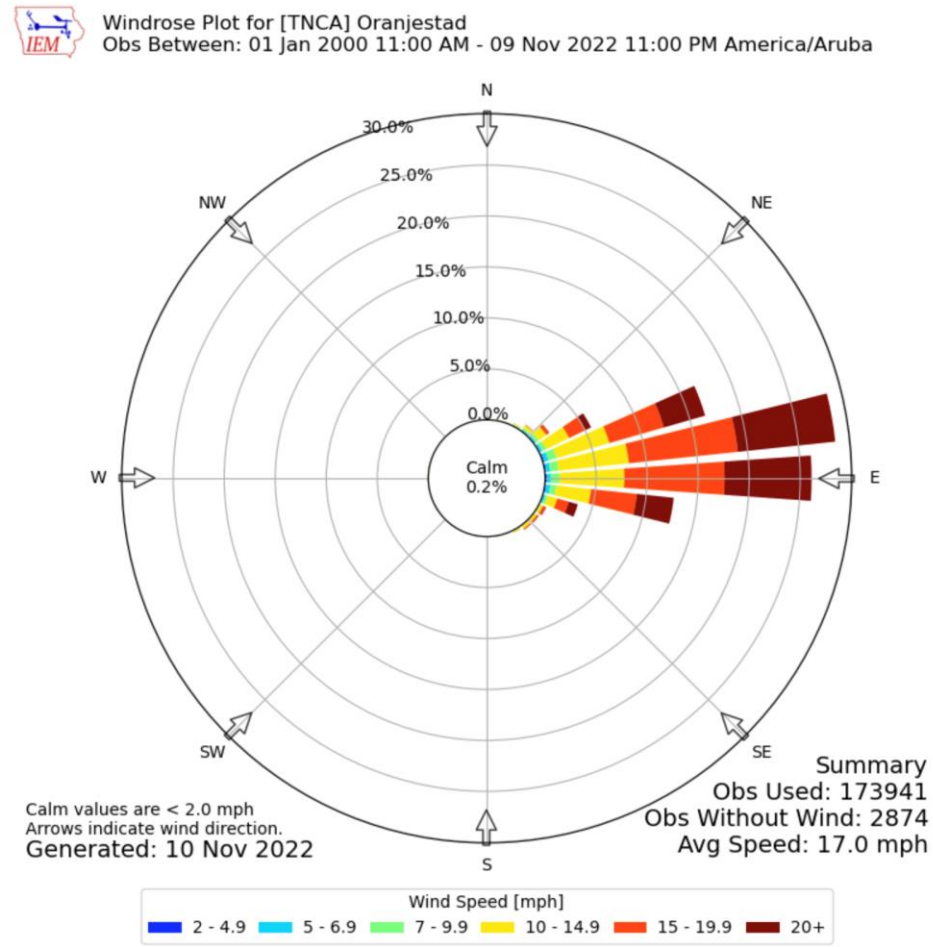
wind wave conditions but also the direction of the sand transport may deviate considerably. These events occur only a few times a year and measurements of the waves and the behaviour of the beaches were almost absent. As our field campaign was only of short duration we tried to analyse the effect of the swell wave events by analysing the grain size data, beach profiling and refraction computations. Fortunately during our campaign Hurricane David (1979) passed by and we were able to measure the effects on the beach.

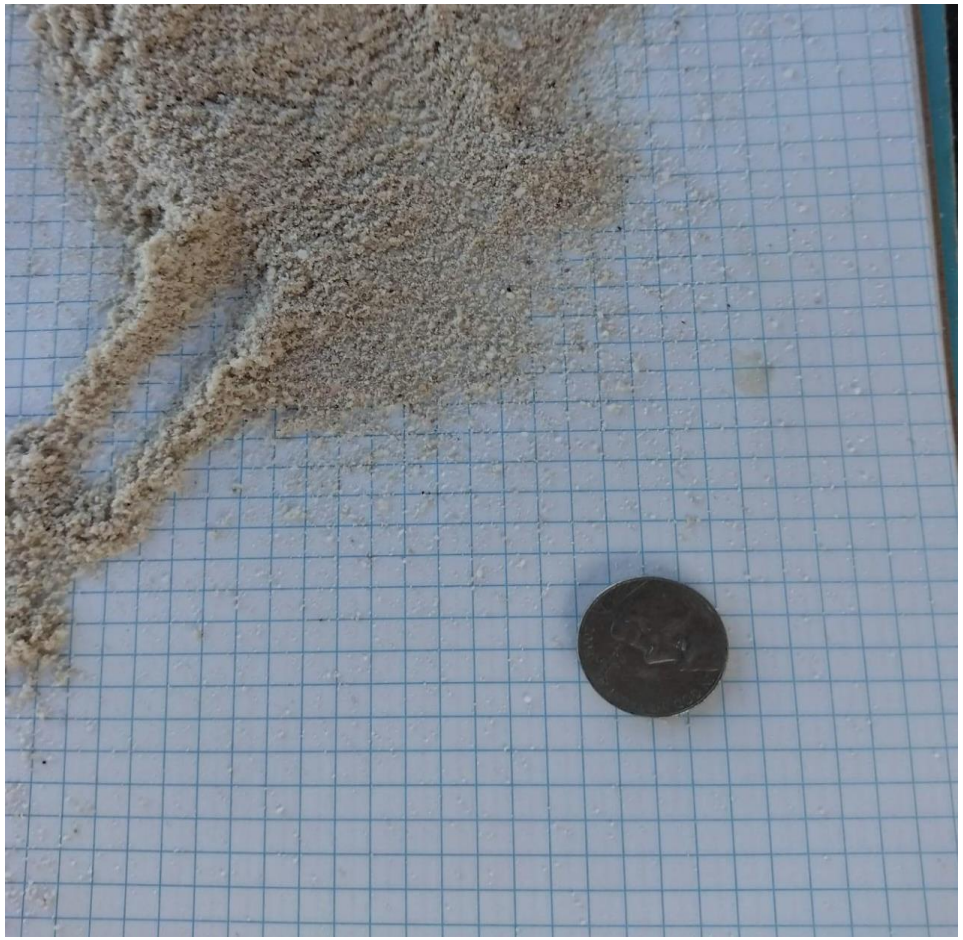
The depth-limitation of grain movement under swell waves may be evaluated as follows. Swell waves approaching the west coast of Aruba may have an H_o up to 3 m and T_o of 8-12 sec.

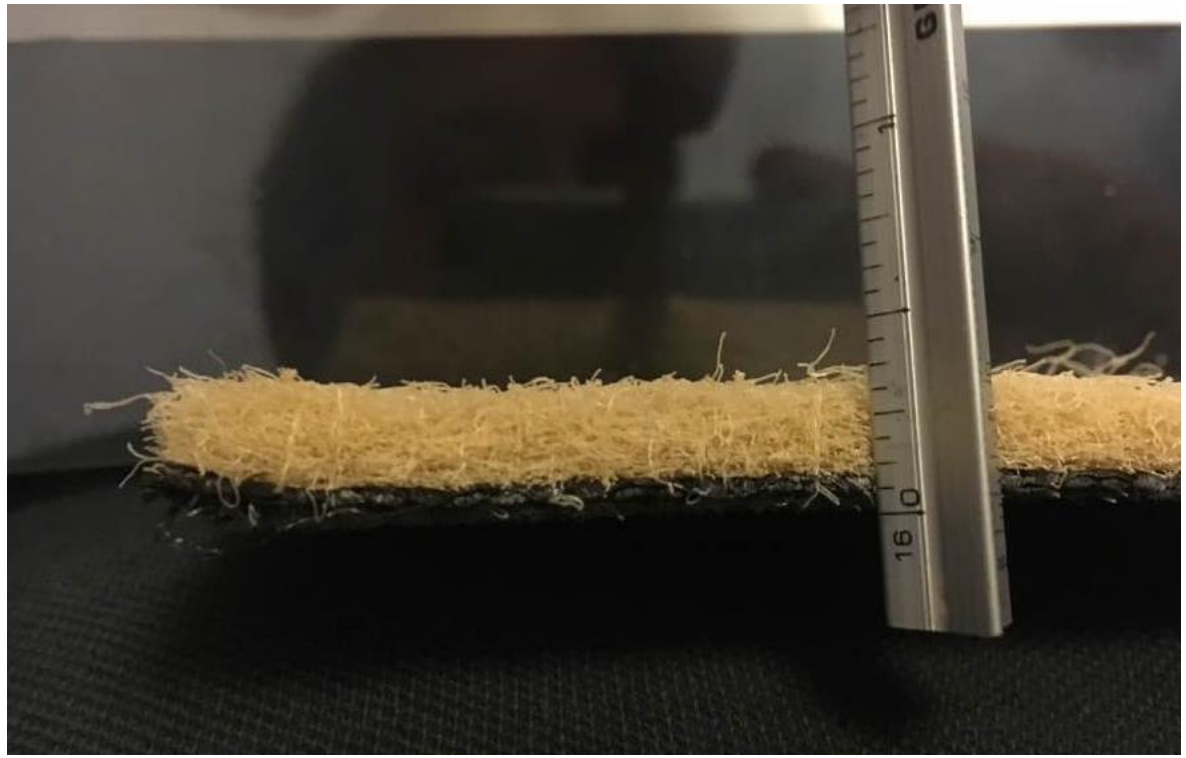
Referring to Table 1 and Figure 5, it may be anticipated that occasionally swell waves may be able to set sediment in motion up to water depths of

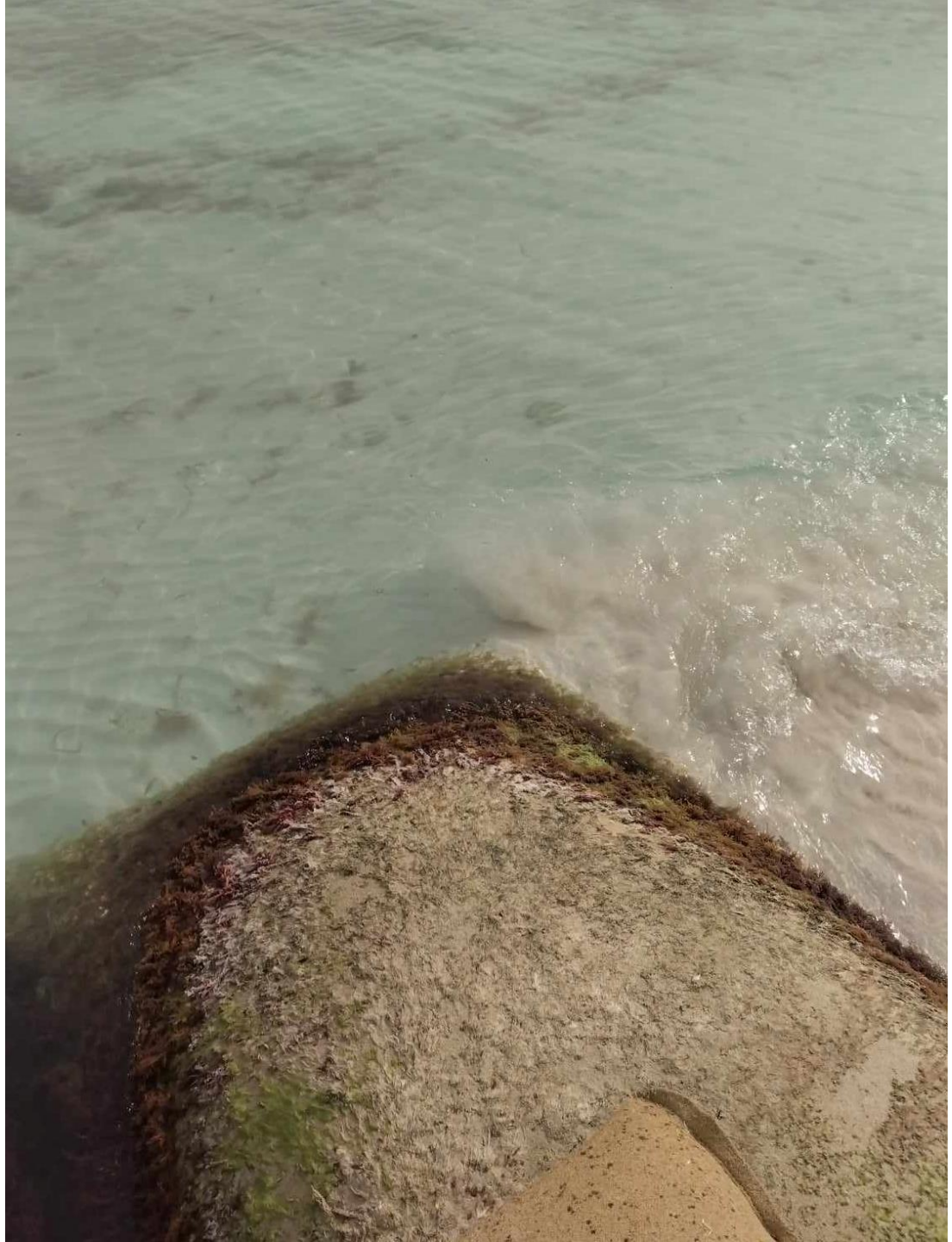
the refraction patterns. Two distinct patterns may be distinguished depending on the origin of the swell, *viz.* outside the Caribbean Island Arch and within the Arch: the "outside" and "inside" system, respectively. The wave approach from the outside system to the island of Aruba is almost unidirectional ($\varphi_o = 20$). This unidirectionality is caused by the fact that only waves travelling in the direction of the Passage (Mona, Anegada, Guadeloupe: Figure 1) can enter the Caribbean Sea. The wave period of these long-distance waves varies between 8-15 sec. The inside system is characterized by multi-directional wave approach, from 20-300°, changing with the course of the track. The period is almost constantly 8 sec during swell. The computation of the refraction pattern used here for quantitative interpretation goes in two steps, *viz.*:

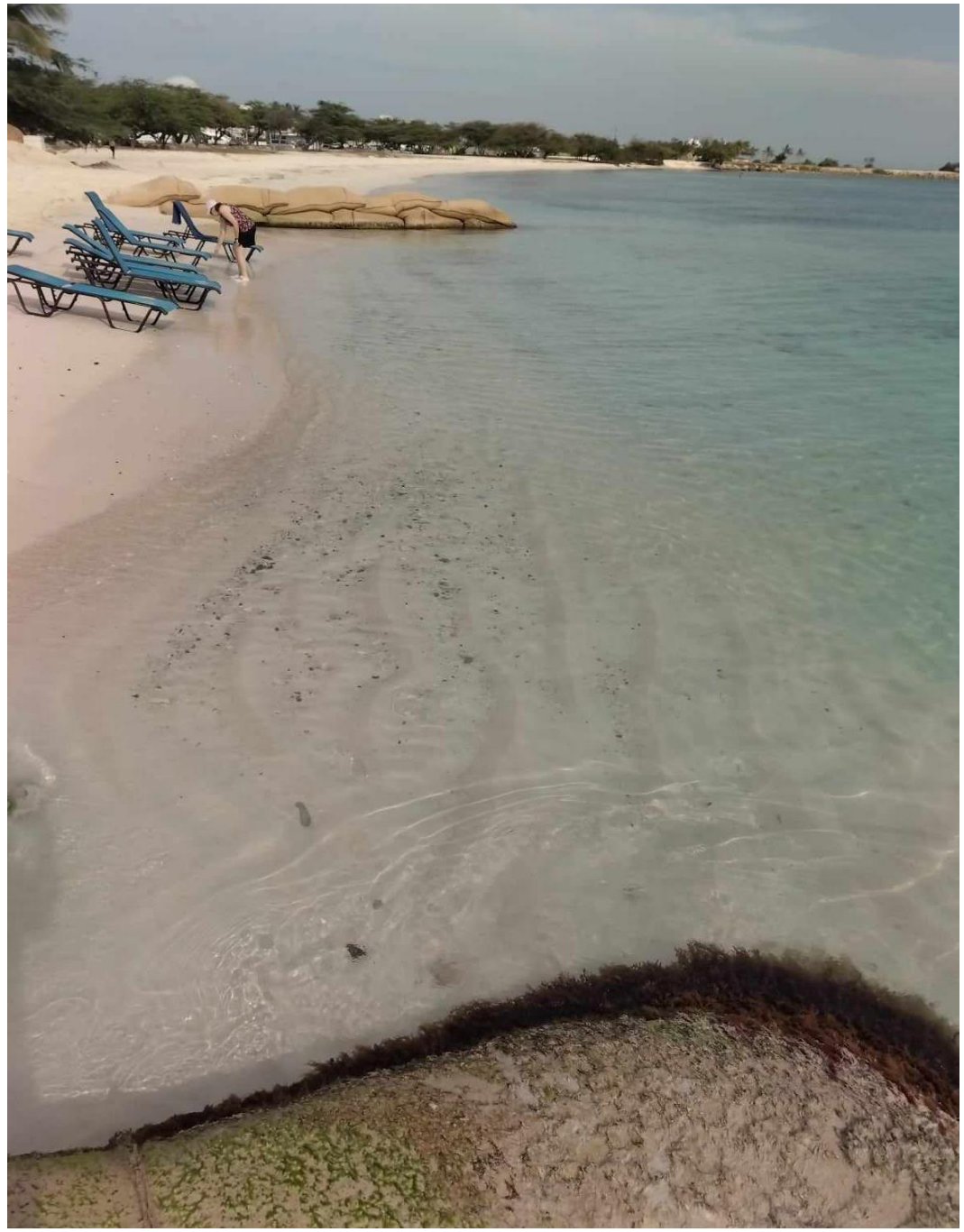

Windrose Plot for [TNCA] Oranjestad
Obs Between: 01 Jan 2016 01:00 AM - 09 Nov 2022 11:00 PM America/Aruba
N
NE
E
SE
S
SW
W
NW
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Calm
0.1%
Calm values are < 2.0 mph
Arrows indicate wind direction.
Generated: 10 Nov 2022
Summary
Obs Used: 58135
Obs Without Wind: 534
Avg Speed: 17.4 mph
Wind Speed [mph]
2 - 4.9
5 - 6.9
7 - 9.9
10 - 14.9
15 - 19.9
20+

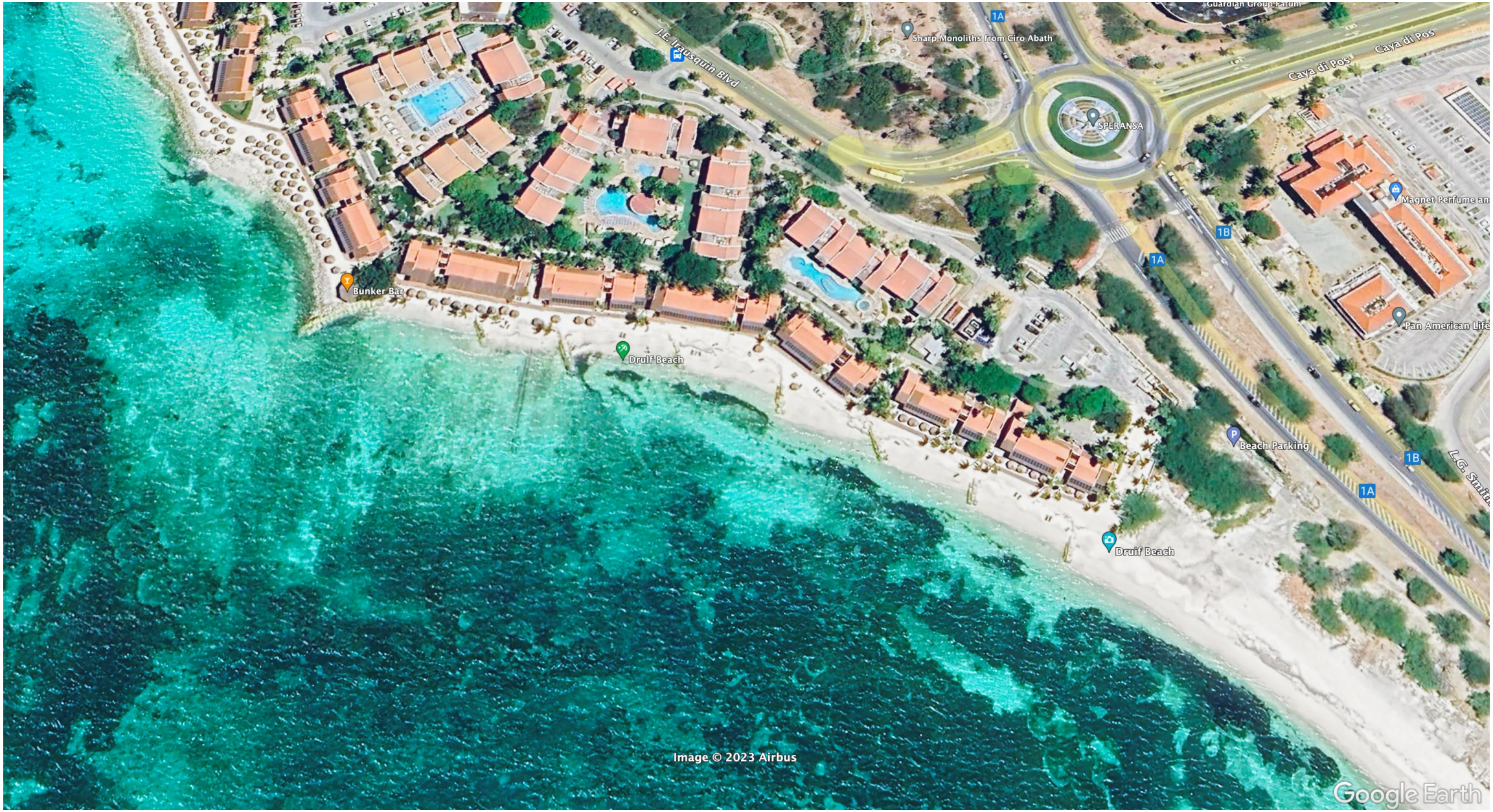

Windrose Plot for [TNCA] Oranjestad
Obs Between: 01 Jan 2000 11:00 AM - 09 Nov 2022 11:00 PM America/Aruba
N
NE
E
SE
S
SW
W
NW
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Calm
0.2%
Calm values are < 2.0 mph
Arrows indicate wind direction.
Generated: 10 Nov 2022
Summary
Obs Used: 173941
Obs Without Wind: 2874
Avg Speed: 17.0 mph
Wind Speed [mph]
2 - 4.9
5 - 6.9
7 - 9.9
10 - 14.9
15 - 19.9
20+







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1A
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