

Supplementary material on “Short-term foredune dynamics in response to invasive vegetation control actions”



Figure S 1. Porto Santo Island, perspective to northeast. Yellow circle: study area (LIFE-Dunas project intervention area). Label refers to main peaks surrounding the study area.

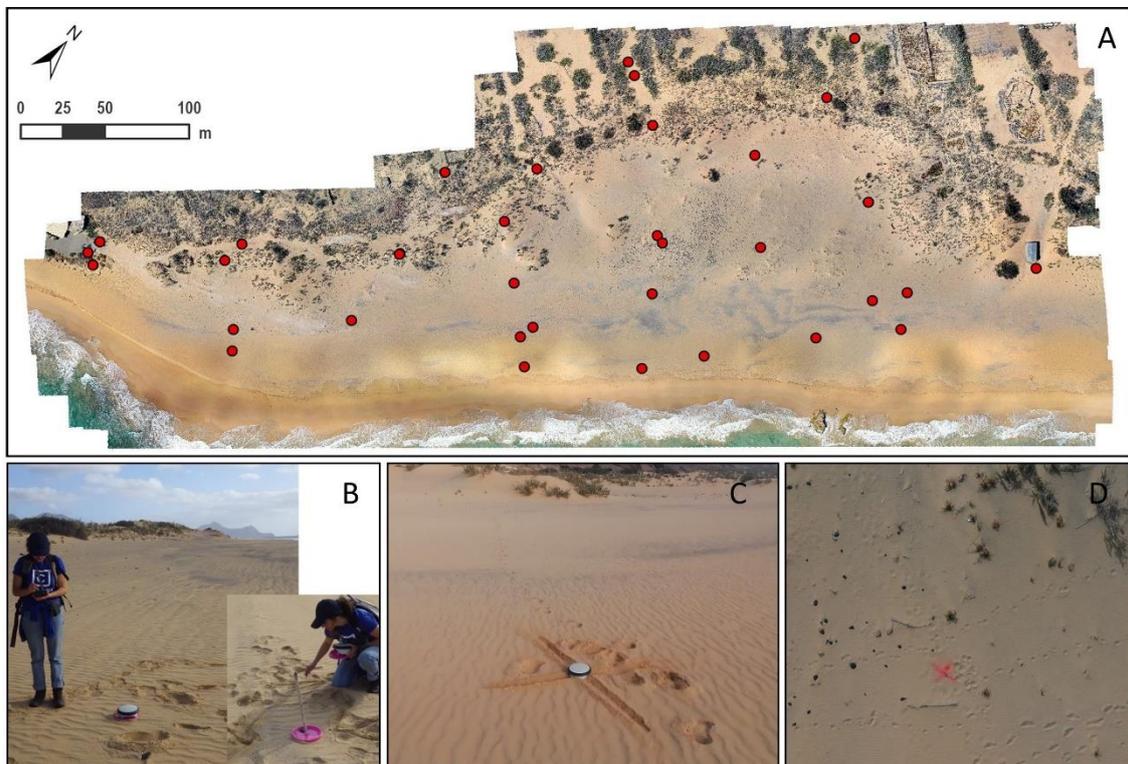


Figure S 2. (A) Location of the GCP used in the October 2020 UAV survey. GCP marking and RTK-GPS measurement GCP using (B) colored plastic plates, (C) sand marks or (D) marks with fluorescent biodegradable paint.

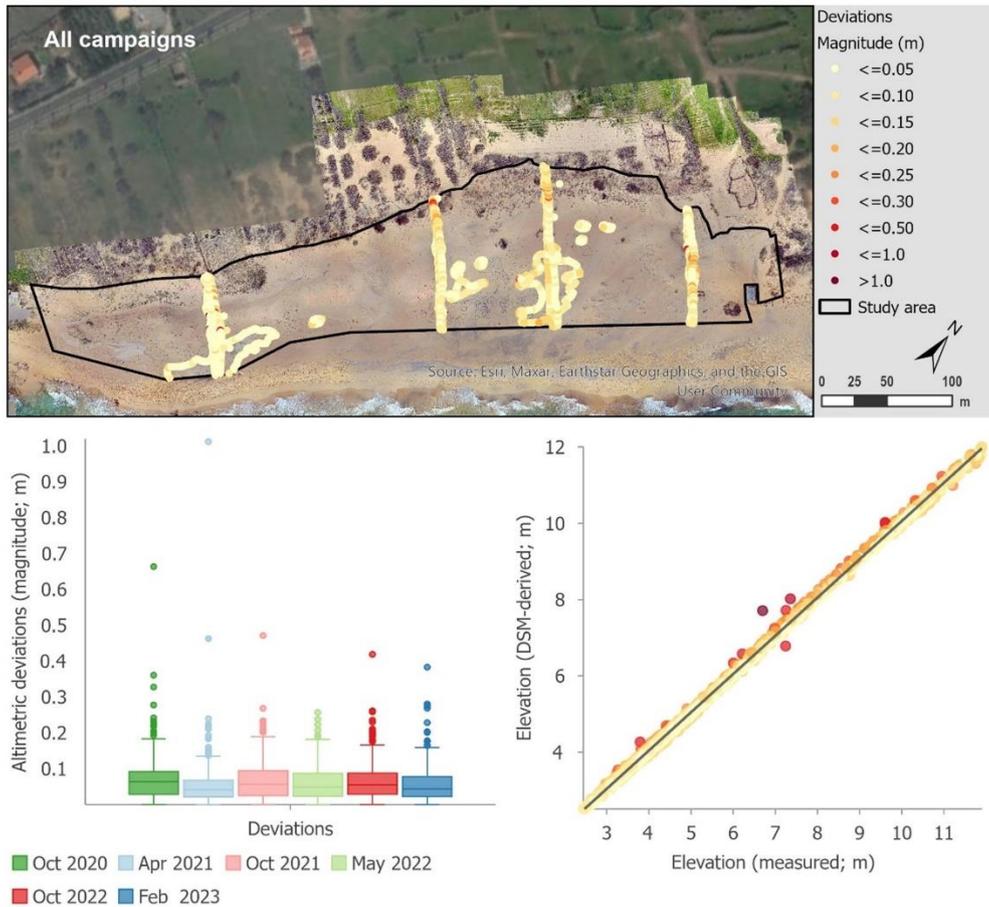


Figure S 3. Top: Illustration of the absolute altimetric deviations associated with all DSM in the study area over ESRI Basemap and Feb 2023 orthomosaic. Bottom: Box-plot (left) and scatter diagram (right) of altimetric deviations between interpolated (DSM) and measured (RTK-GPS) homologous points.

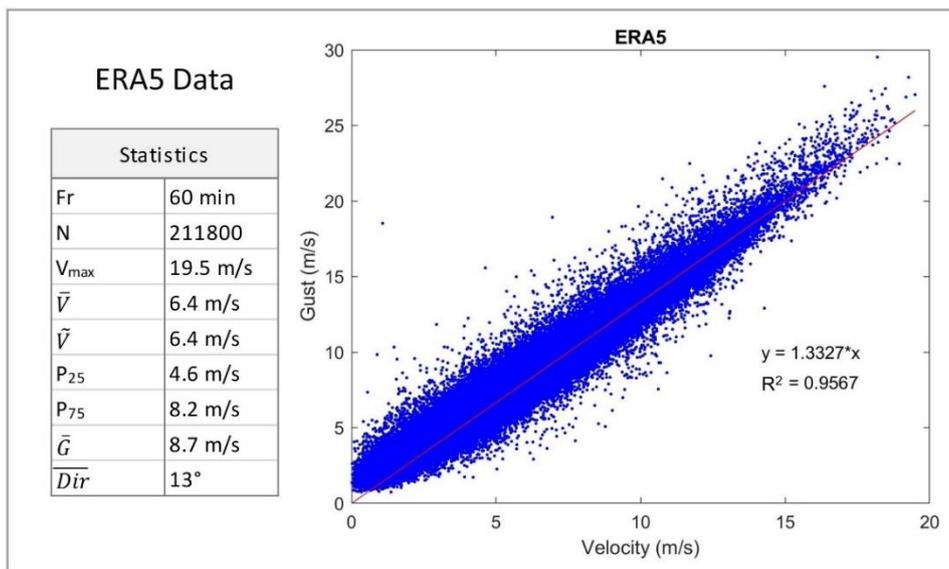


Figure S 4. Wind data (between 1999 and Feb. 2023). Left - wind statistics: Fr (frequency of records); N (number of records); V_{max} (maximum velocity); \bar{V} (mean velocity); \tilde{V} (median velocity); P₂₅ (velocity 25th percentile); P₇₅ (velocity 75th percentile); \bar{G} (average gust) and \overline{Dir} (upwind vectorial mean direction). Right - scatter diagram of wind speed *vs.* gust. In red, linear fit to the data; linear equation and correlation coefficient (R²).

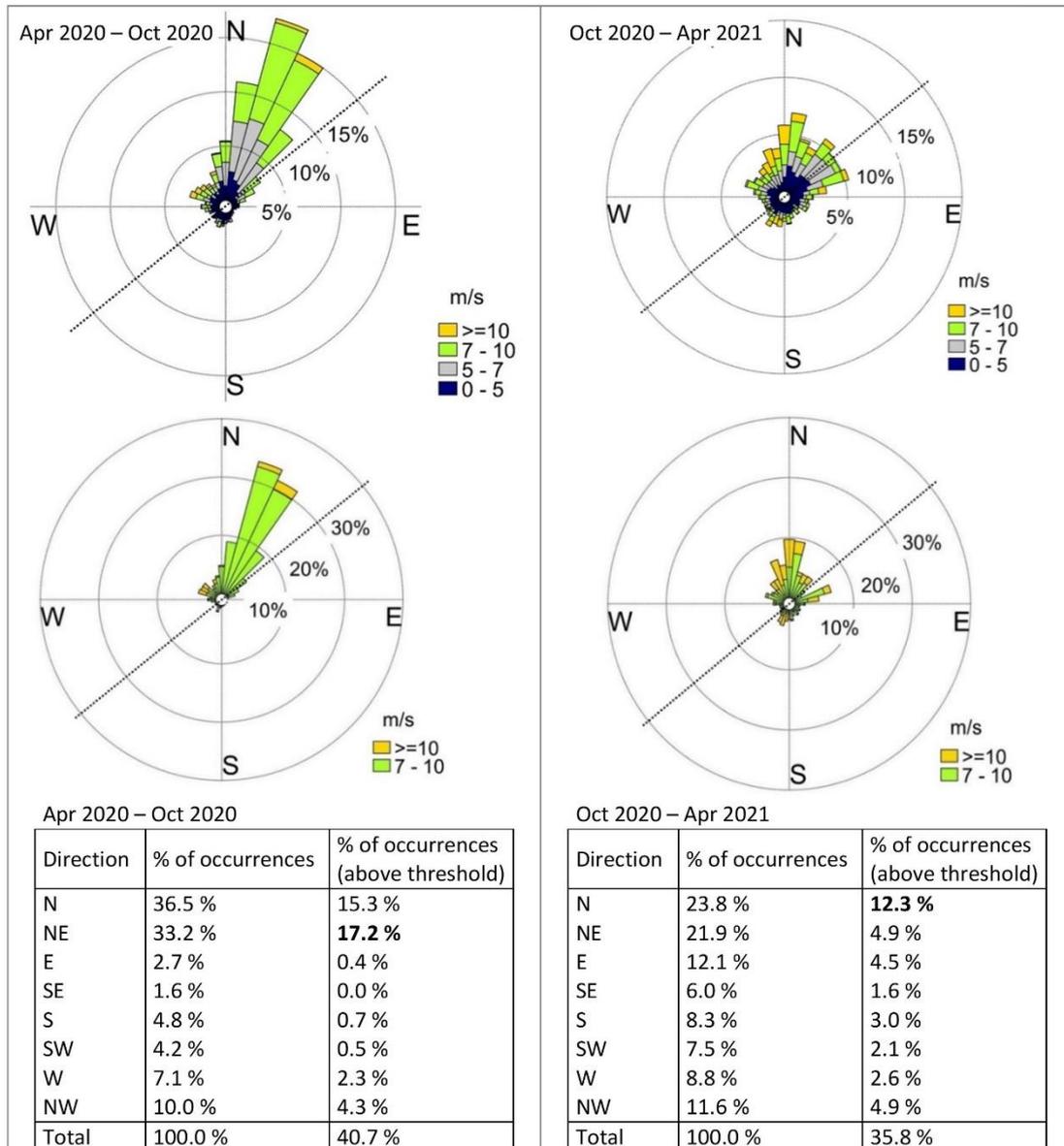


Figure S 5. Joint distribution of wind direction and speed between Apr 2020 - Oct 2020 (top) and Oct 2020 – Apr 2021 (bottom). Black dotted line represents coastline direction. Upper diagrams: all records. Lower diagrams: winds above dynamic threshold.

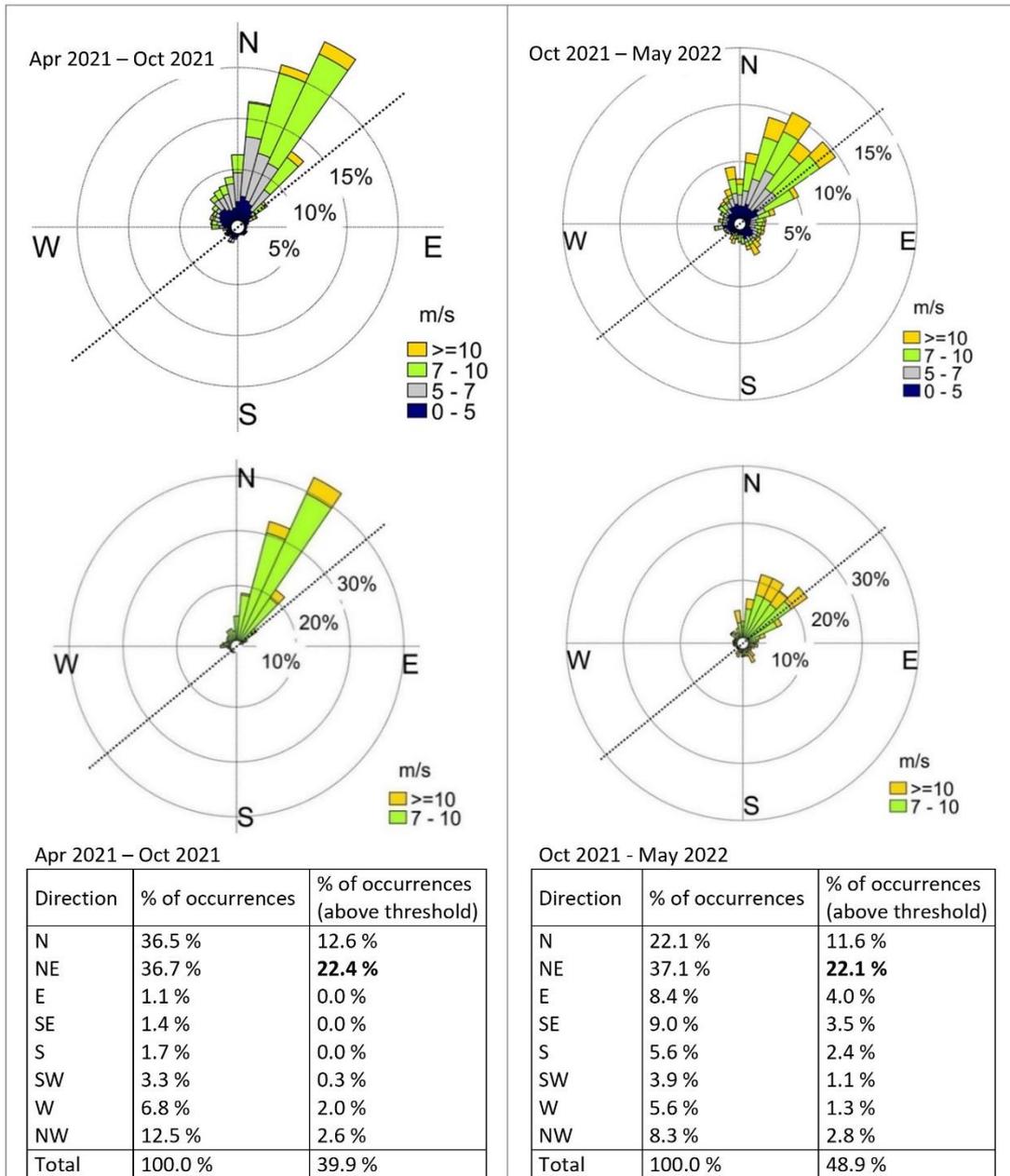


Figure S 6. Joint distribution of wind direction and speed between Apr 2021 - Oct 2021 and Oct 2021 – May 2022. Black dotted line represents coastline direction. Upper diagrams: all records. Lower diagrams: winds above dynamic threshold.

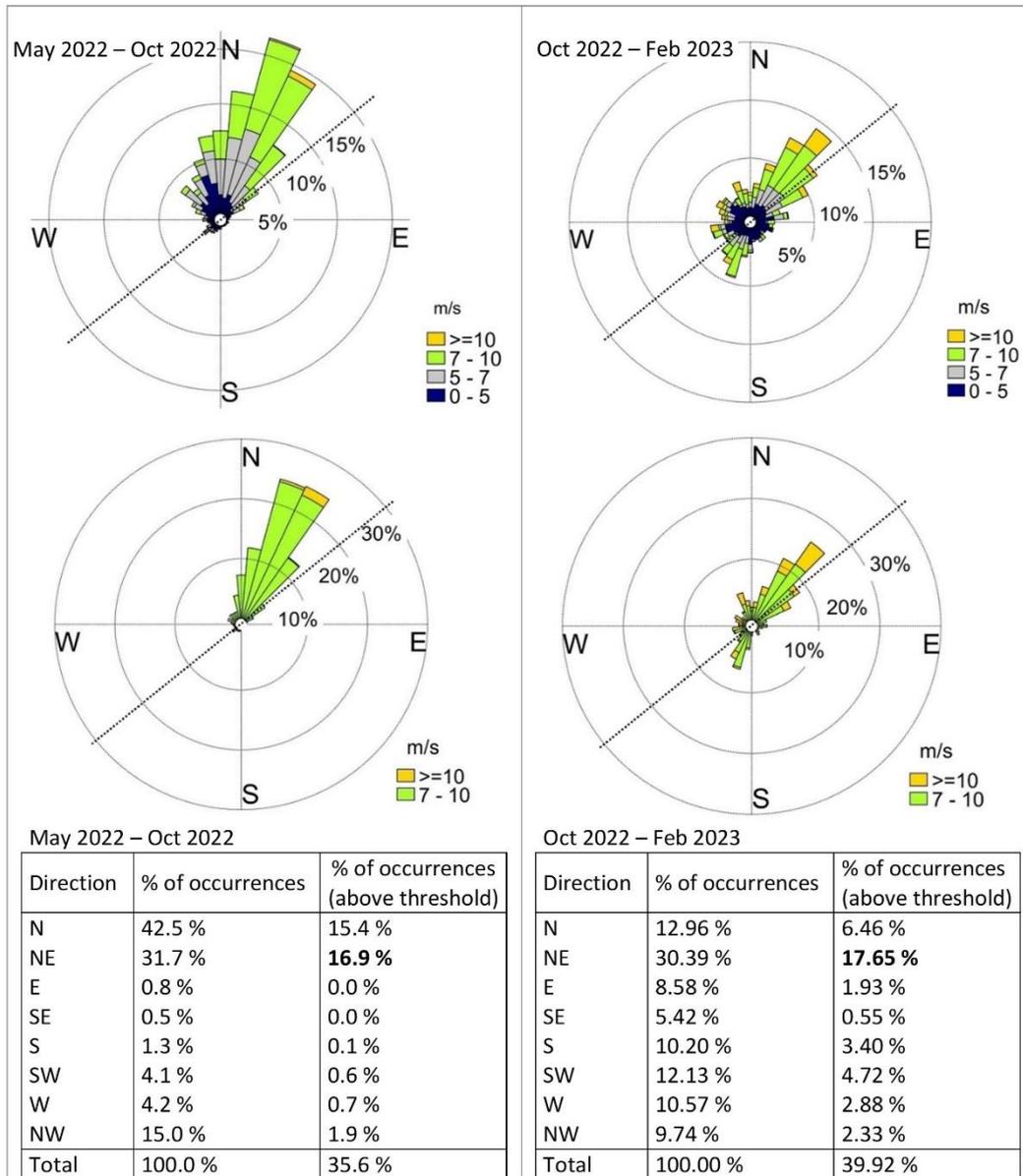


Figure S 7. Joint distribution of wind direction and speed between May 2022 – Oct 2022 and Oct 2022 – Feb 2023. Black dotted line represents coastline direction. Upper diagrams: all records. Lower diagrams: winds above dynamic threshold.

Table S 1. UAV flight dates; average flight altitude (m); overflown area (m²); number of images; number of measured GCP. DSM and orthomosaic resolutions.

UAV survey					UAV outputs	
Flight date	Average altitude (m)	Overflown area (m ²)	Images	GCP	DSM pixel resolution (m)	Orthomosaic pixel resolution (m)
13/10/2020	60	133 000	302	27	0.025*	0.015
07/04/2021	50	160 000	1009	27	0.025	0.015
06/10/2021	50	112 000	502	26	0.025	0.015
12/05/2022	50	155 000	547	37	0.025	0.015
12/10/2022	50	123 000	645	28	0.025	0.015
25/02/2023	50	145 000	761	22	0.025	0.015

* Agisoft automatically yielded a default 0.03 m resolution DSM that was resampled to 0.025 m to match subsequent models.

Table S 2. Total area and bare sand area (m²) per geomorphologic unit.

Geomorphologic unit	Area		
	Total	Bare sand	
	m ²	m ²	%
Foredune	24705	13708	55
Beach	1643	1485	90
Interdune	1057	542	51
Rocky outcrop	3012	2678	89
Second dune	5794	1521	26
Deflation basin	13209	11763	89
Nebka	354	202	57
Total	49773	31899	64