

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.

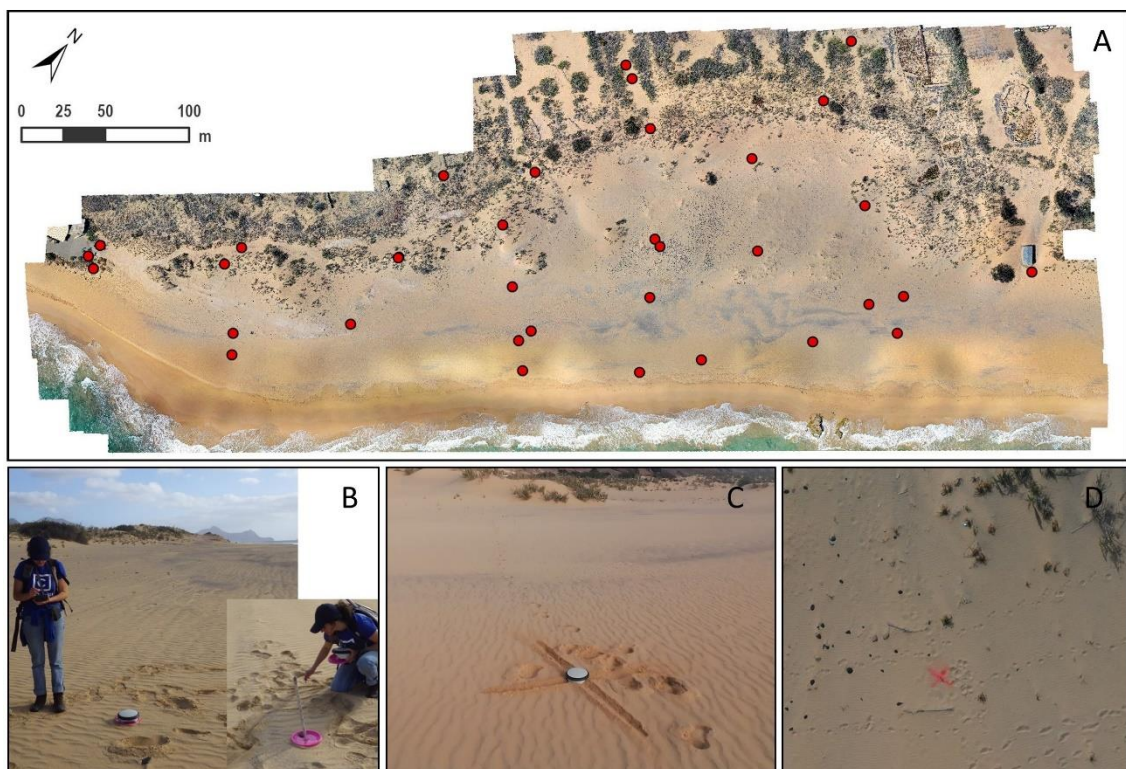


Figure S 2. (A) Location of the GCP used in the October 2020 UAV survey. GCP marking and RTK-GPS measurement GCP using (B) colored plastic plates, (C) sand marks or (D) marks with fluorescent biodegradable paint.

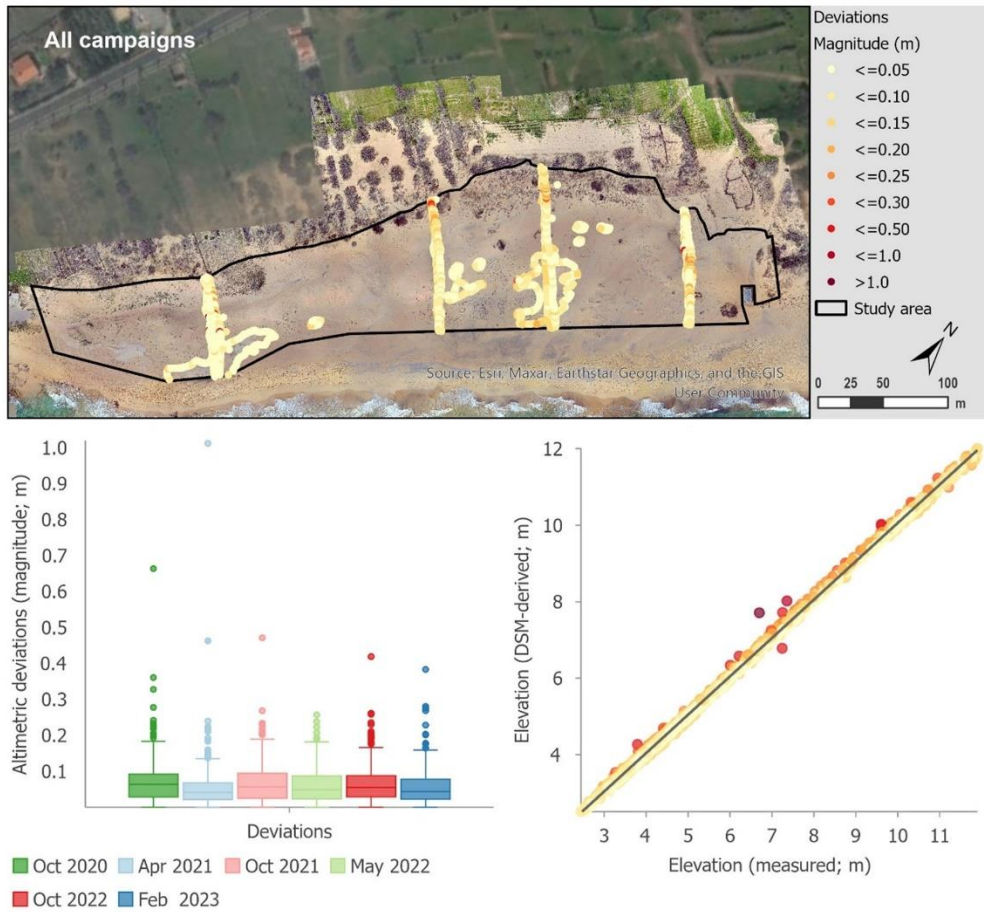


Figure S 3. Top: Illustration of the absolute altimetric deviations associated with all DSM in the study area over ESRI Basemap and Feb 2023 orthomosaic. Bottom: Box-plot (left) and scatter diagram (right) of altimetric deviations between interpolated (DSM) and measured (RTK-GPS) homologous points.

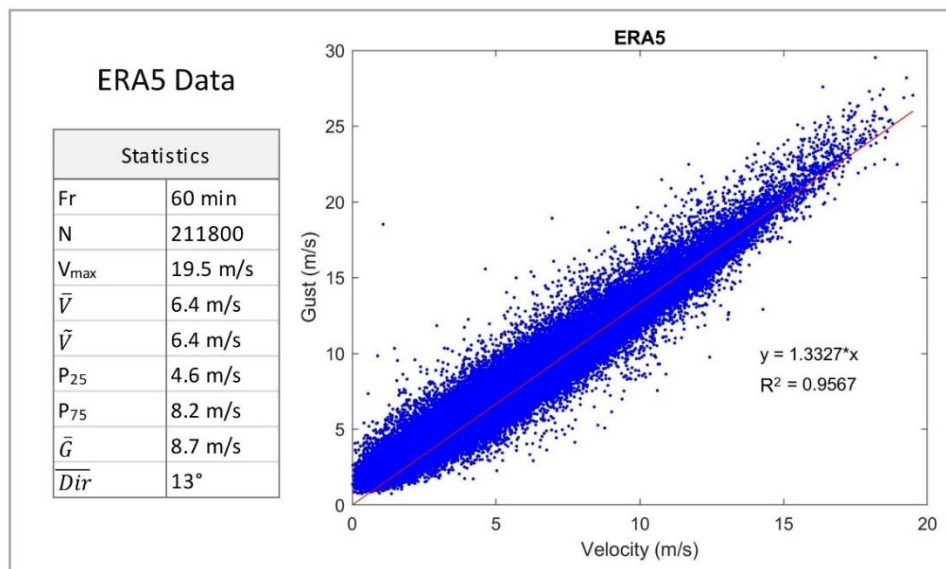


Figure S 4. Wind data (between 1999 and Feb. 2023). Left - wind statistics: Fr (frequency of records); N (number of records); V_{max} (maximum velocity); \bar{V} (mean velocity); \tilde{V} (median velocity); P₂₅ (velocity 25th percentile); P₇₅ (velocity 75th percentile); \bar{G} (average gust) and \overline{Dir} (upwind vectorial mean direction). Right - scatter diagram of wind speed *vs.* gust. In red, linear fit to the data; linear equation and correlation coefficient (R^2).

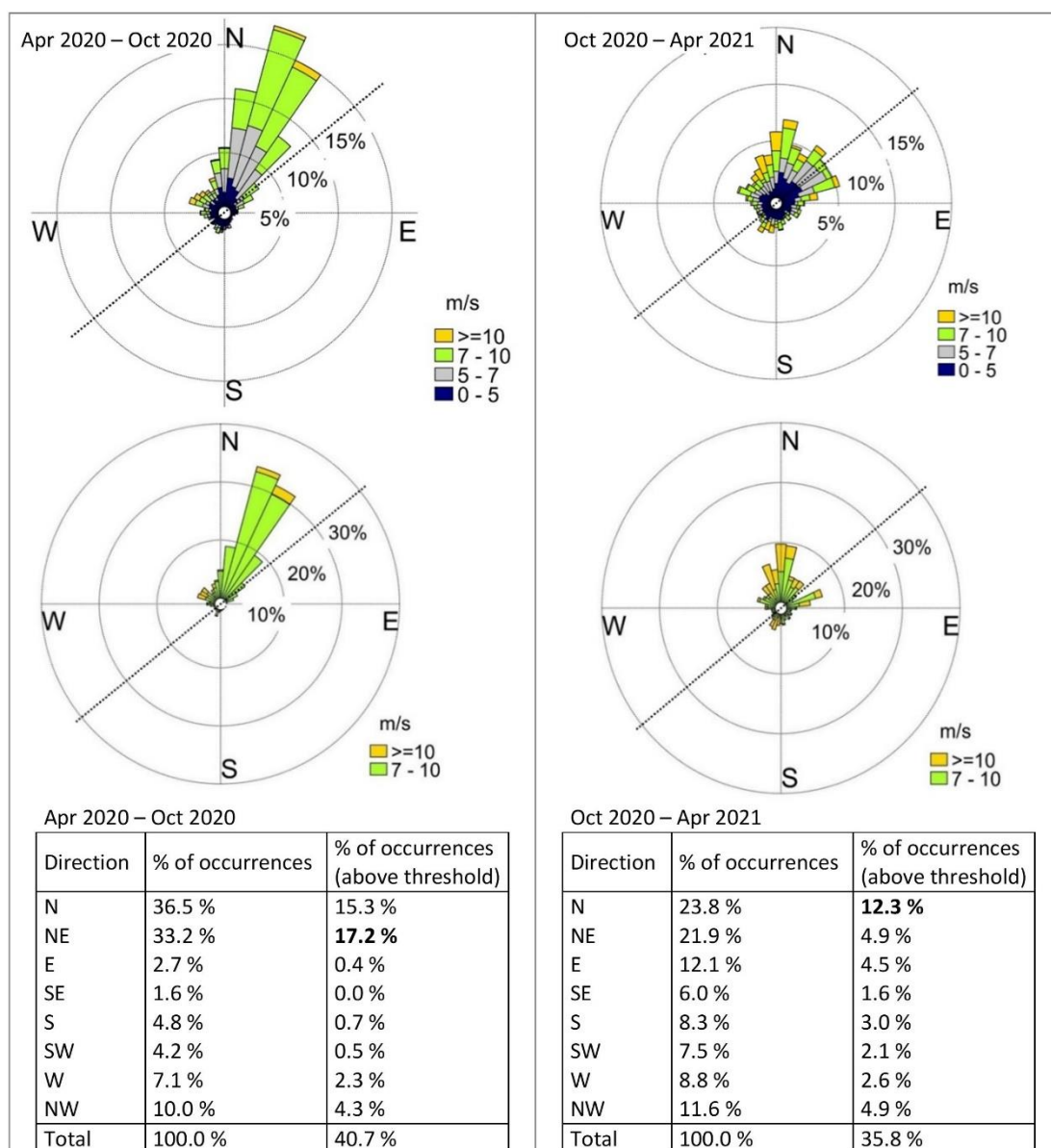


Figure S 5. Joint distribution of wind direction and speed between Apr 2020 - Oct 2020 (top) and Oct 2020 – Apr 2021 (bottom). Black dotted line represents coastline direction. Upper diagrams: all records. Lower diagrams: winds above dynamic threshold.

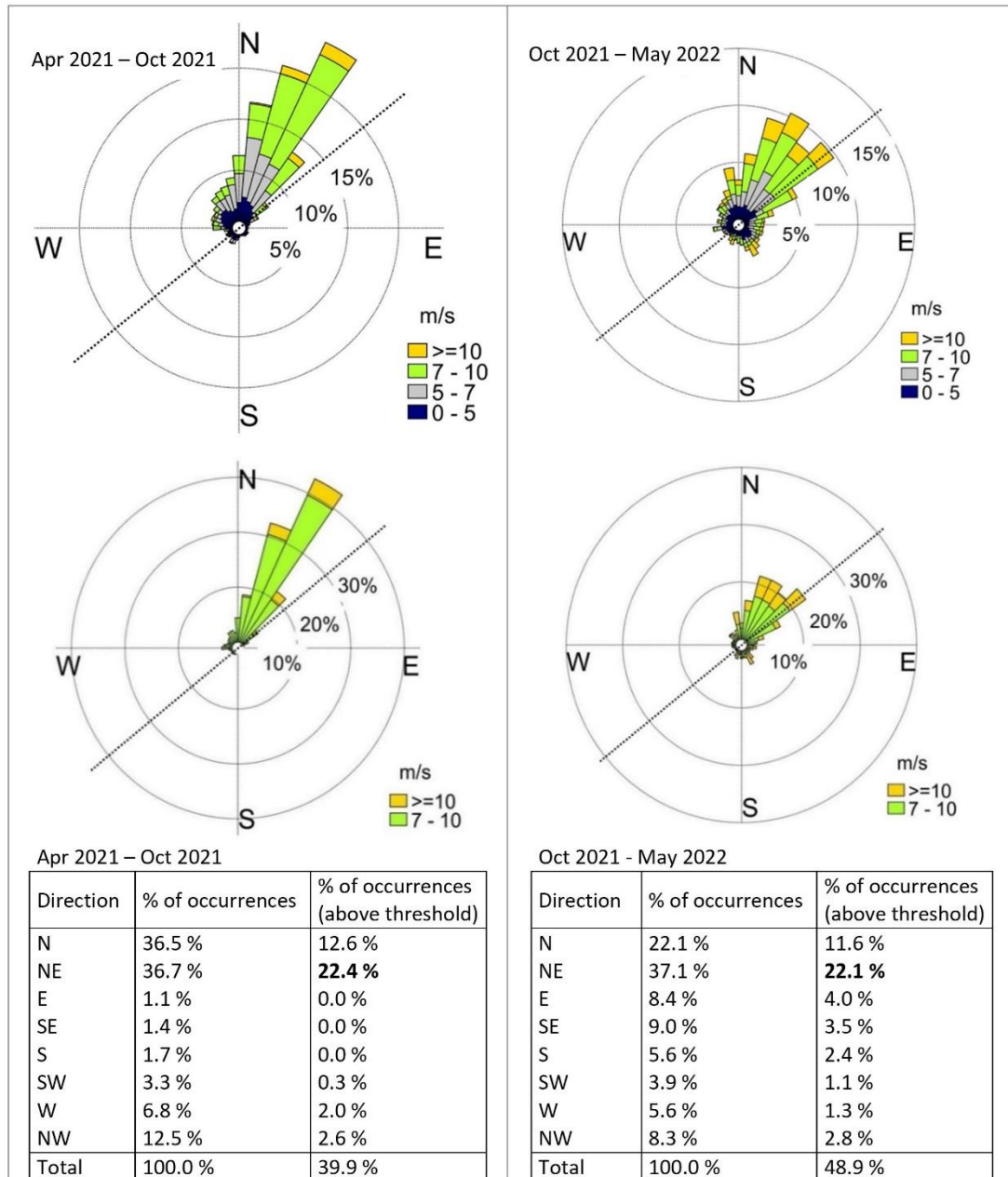


Figure S 6. Joint distribution of wind direction and speed between Apr 2021 - Oct 2021 and Oct 2021 – May 2022. Black dotted line represents coastline direction. Upper diagrams: all records. Lower diagrams: winds above dynamic threshold.

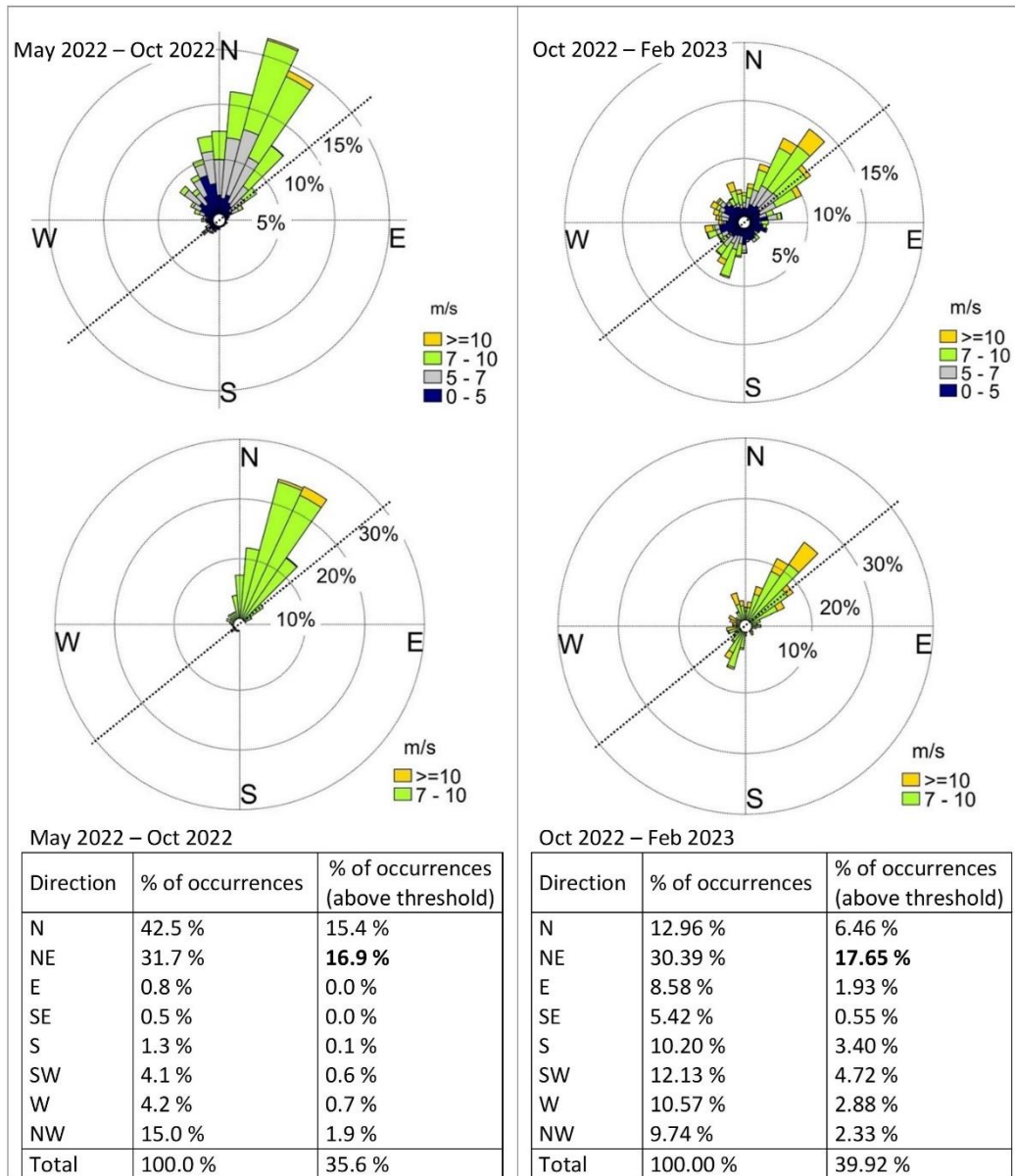


Figure S 7. Joint distribution of wind direction and speed between May 2022 – Oct 2022 and Oct 2022 – Feb 2023. Black dotted line represents coastline direction. Upper diagrams: all records. Lower diagrams: winds above dynamic threshold.

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 |