Altitudes Above Sea Level of the Boccarda Tank Covers from DJI Terra Calculations (Flights on 12 April and 18 June 2024)
Report as of 3 July 2024 Rev.0a
Flight Processing Overview

The DJI Terra software provided altitude data above sea level in a chromatic scale, detailed in the dsm_screennail.png file found in the map/report folder. By adding a reading scale with 1-meter steps, positions of the tank covers (S1 to S5) can be easily identified. Figure 1.a shows the dsm_screennail.png from the June 18 flight, while Figure 2.a includes the added scale and tank numbering.

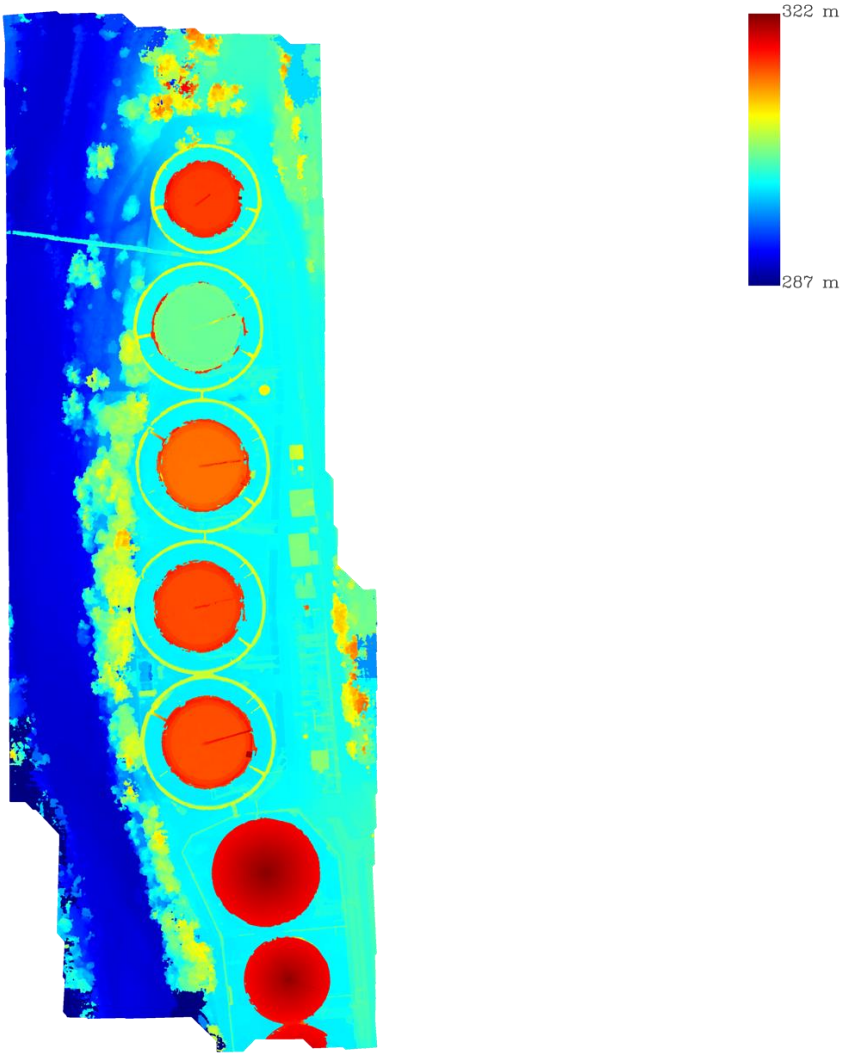


Figure 1.a

In figure 2.a you can see the same file*dsm_screennail.png*with the addition of a scale to facilitate reading the altitudes and the numbering of the tanks from S1 to S5.

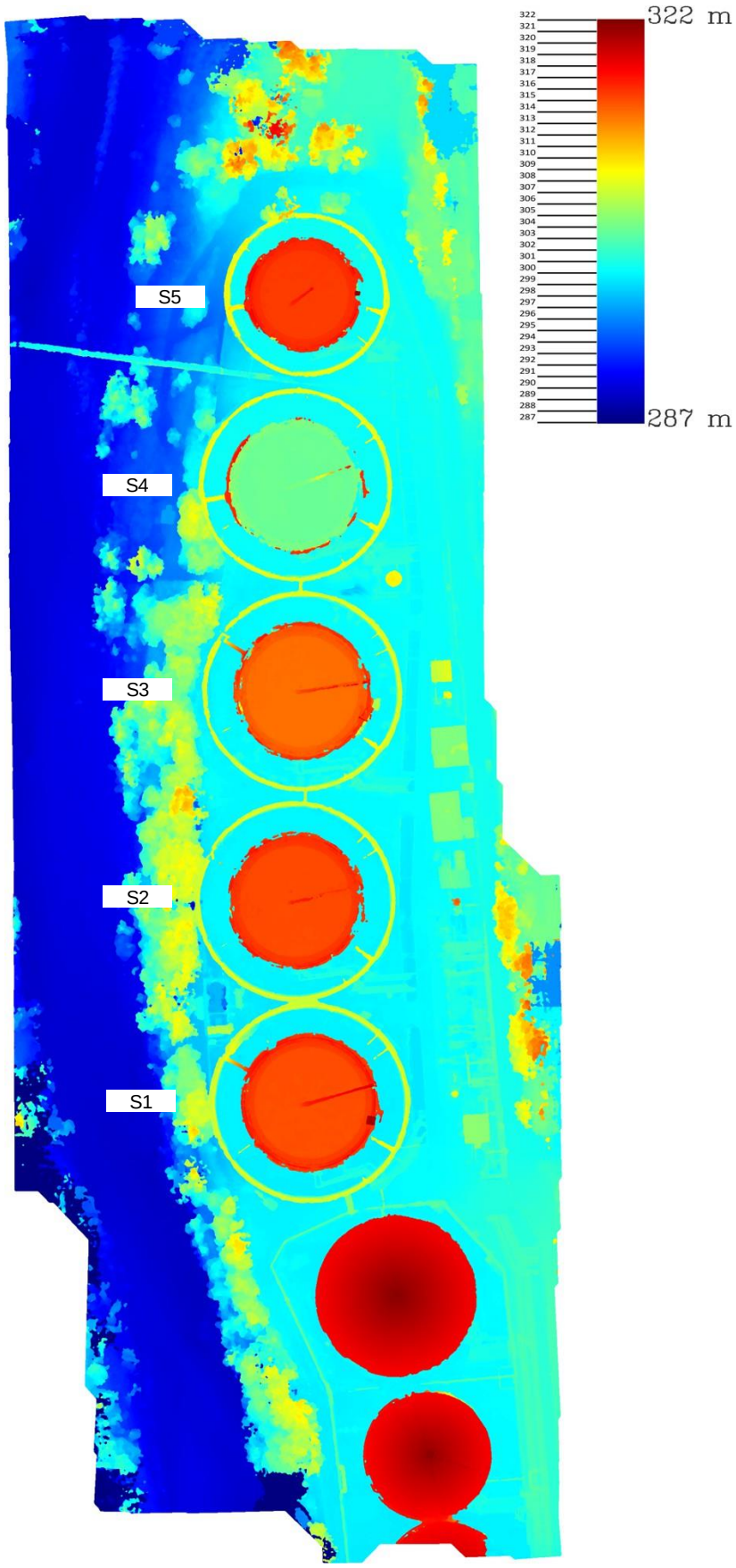


Fig2.a

Observations

Despite the limited resolution, several elements are discernible:

- Access stairs to the covers.
- S4 tank's low position during the flight.
- Containment walls of the tanks (yellow).
- Slightly concave tank lids.
- Convex roof of the structure south of S1.
- The plane on which the tanks are built (light blue).
- Surrounding river and vegetation.

For precise measurements, comparisons with known positions or more accurate instruments are necessary. However, this method allows quick and simple data acquisition using basic software tools.

Measurements on the flight file of June 18, 2024

Using chromatic measurements, the approximate altitudes are as follows (rounded to the nearest half meter):

1. Horizontal plane near structures: 300m
2. Pool wall height: 308m
3. S5 center cover: 315.5m
4. S4 center cover: 304m
5. S3 center cover: 314m
6. S2 center cover: 315m
7. S1 center cover: 315m
8. Water level in trap tank: 298m
9. Passarella on Scrivia: 300.5m
10. Center of structure lid near S1: 321.5m
11. Exterior of lid near S1: 318m

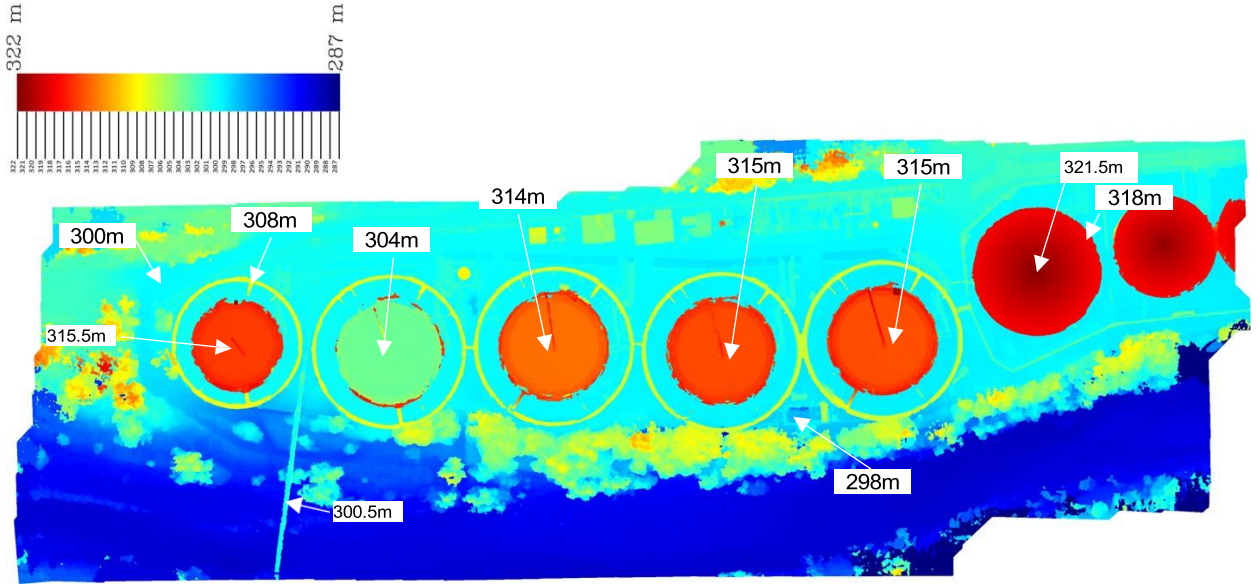


Figure 3.a

Measurements on the flight of April 12, 2024

Figure 4.a shows the `dsm_screennail.png` from the April 12 flight with the following measured values:

- Horizontal plane near structures: 210m
- Pool wall height: 218m
- S5 center cover: 218.5m
- S4 center cover: 225.5m
- S3 center cover: 222.5m
- S2 center cover: 224m
- S1 center cover: 217m
- Water level in trap tank: 207.5m
- Passarella on Scrivia: 210.5m
- Center of frame lid near S1: Not shown
- Exterior of structure cover near S1: Not present

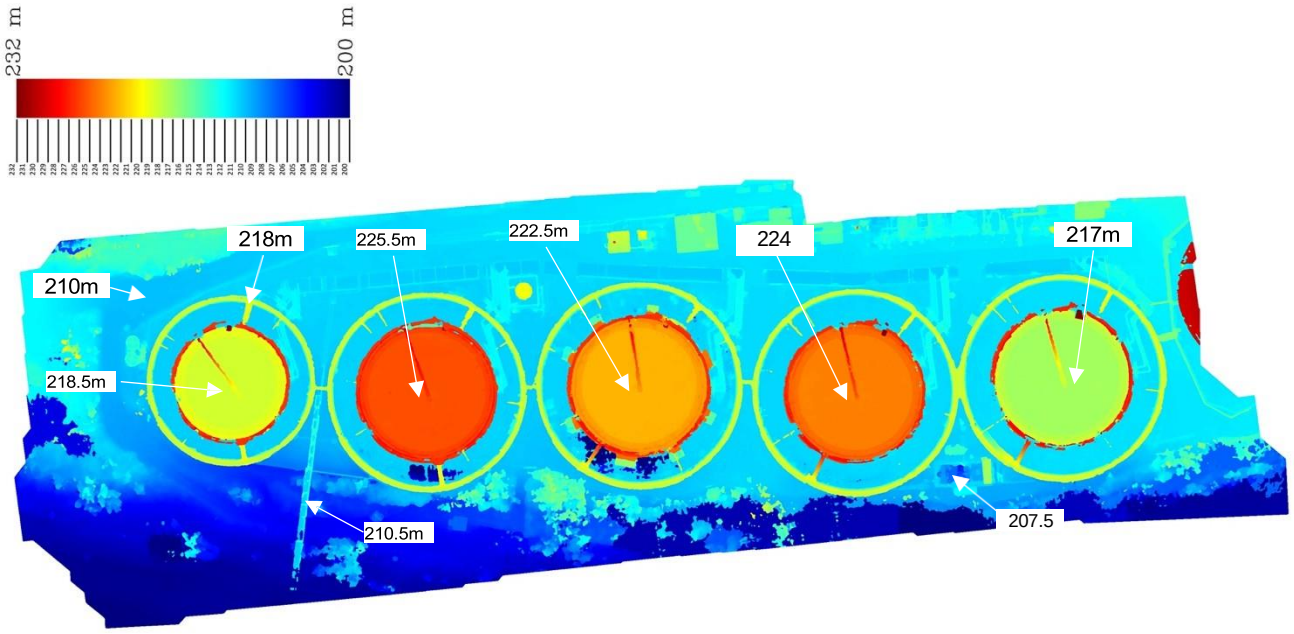


Figure 4.a

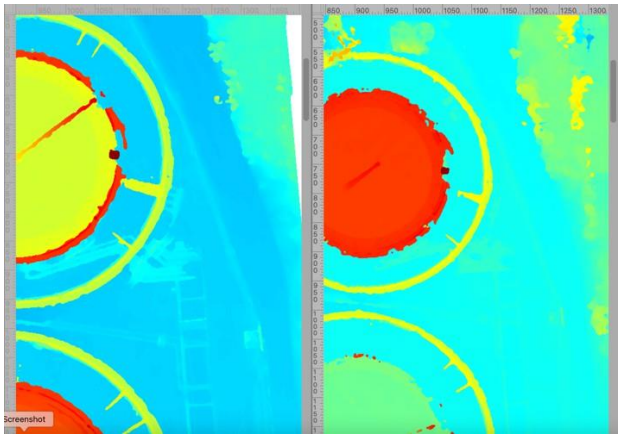
It should be remembered that given the limited chromatic resolution of the image, the measurements are necessarily approximate, with a reading inaccuracy of +-0.25m linked to the system and scale chosen.

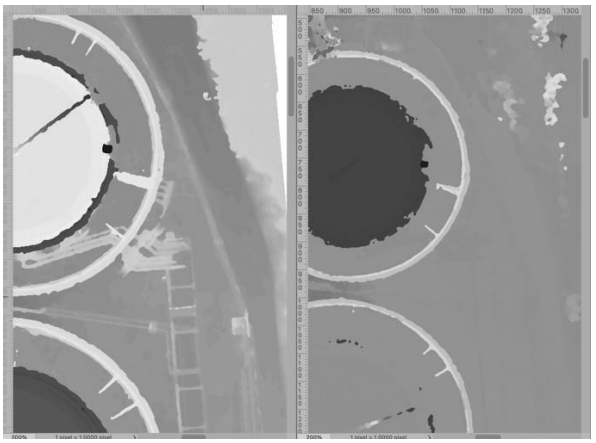
Comparison and analysis of the files processed by the two flights

Comparing the two `dsm_screennail.png` files from April and June reveals inconsistencies due to different processing parameters. For example, the ground level around the tanks differs significantly:
- June 18: 300m above sea level
- April 12: 210m above sea level
- Google Earth: 354m above sea level

Standardizing processing parameters is crucial for consistency. Differences in relative heights

between elements were generally consistent, despite some anomalies, like the walkway over the Scrivia stream.





Figures 5.a and 6.a

For the future it is important that the processing parameters are standardized. Probably for the same reason, i.e. two inconsistent calculations, the altitude data above sea level are in turn clearly inconsistent with each other.

The fixed elements such as the ground level around the tanks, the walkway over the stream or the walls of the containment tanks are at different altitudes, and the entire color scales do not correspond, resulting between 287 and 322 meters in figure 3.a (June) and between 200 and 232 meters in figure 4.a (April).

However, it is not relevant that the two scales have different widths because the two processed areas are not identical (for the same reason the altitudes of the roof of the structure south of S1 were not detectable in image 4.a as they were not present).

It must be investigated whether this altimetric difference is linked to the software, to an error in the data

parameters being processed, to the flight data stored or to something else, and how it can be remedied.

If we take the ground level around the tanks as an example we find these values:

- June 18: 300 m above sea level
- April 12: 210 m above sea level
- Google Earth: 354m above sea level

If in the two images observed the accuracy is affected by some probably solvable problem (two new processes should be carried out by checking or setting the altitude parameters etc. and keeping them identical) it is however interesting to evaluate the precision, the differences in relative heights between the various elements in each processing.

If we take the ground level as a basis and look at the relative height of some fixed elements we find that the walls of the containment tanks appear 8 meters high in both images, a perfectly consistent figure

Other elements seem less coherent but could be influenced by the different processing: the walkway over the Scrivia stream seems 0.5 meters above ground level in the June image and 2.5m in the April image, but if we look in detail it is noticeable how the different parameters of the processing make reading difficult and have probably created inaccuracies or small hallucinations.

The same considerations apply to the water collection trap tank (figure 7.a) which in April is at -2.5m compared to the ground, a value to be evaluated but not very different from the -2m in June, therefore apparently coherent.

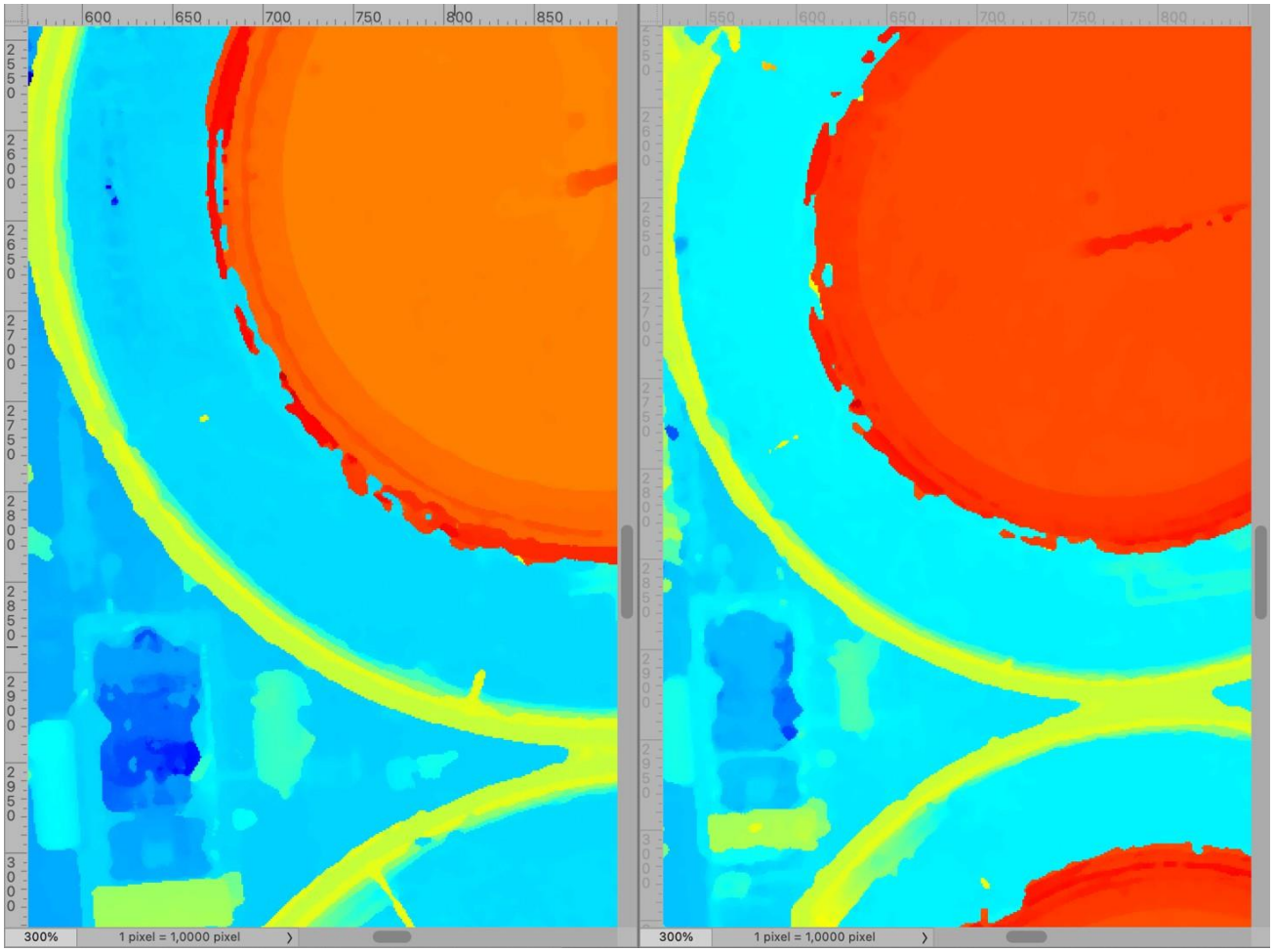


Figure 7.a

Examining the measurements of the altitudes of the tank lids, they are compared to the ground at:

• Reservoir	Lid height in June 15 m	Lid height in April 7 m
• S1	15 m	14 m
• S2	14 m	12.5 m
• S3	4 m	15.5 m
• S4	15.5 m	8.5 m
• S5		

It could be interesting to compare these data with the data certainly present in the company archive and with the results of different processing.

Conclusions and recommendations

1. **Improve File Creation Parameters:** Ensure standardized parameters for consistent data over time.
2. **Use Fixed Color Scales:** For accurate visual and automated comparisons.
3. **Enhance Detail in Files:** Improve resolution and processing detail for more precise measurements.
4. **Compare with Accurate Data:** Validate results against known data and other processing methods.

Overall, the method shows potential for quick, simple data acquisition, though accuracy can be improved with better file creation and processing parameters.