240614b - Lady Moon, MonViso and Superga final study

This awesome picture was taken by M. Valerio Minato from ***Torino (Italy)*** on ***Dec 15, 2023***.
This document finalizes our studies to attempt best pinpointing the exact place from which this Picture was taken.
First of all, the incredible alignment of both the steeple of the ***Superga Basilica*** and ***MonViso*** with ***Lady Moon*** - all in the same ***Azimuth 229.682° -*** indicates that ***this picture was taken at 17h54m15s UT (+/- 5s).***

(1) - In previous publications from various Contributors in the NavList Forum, from Feb 28th 2024 until Apr 04th, 2024 the following data were published:

(1.1) - Using the Moon Horizontal diameter (32'.460) as a benchmark, ***on the Picture the refracted vertical distance between the Steeple and MonViso is 10.1' and the Moon Upper Limb is 1.1' above MonViso***.

(1.2) - Pending further information *then missing* about actual Atmospheric refraction, and from:
1.2.1 - Superga Steeple: N45°04.845'/E007°46.062'/ + 794m (WGS84)
1.2.2 - MonViso: N44°40.059'/E007°05.434'/ +3895m (WGS84)
the following Observer's ***provisional position*** was computed at:
1.2.3 - N45°08.511'/E007°52.154'/+436m (WGS84)
from which the following WGS84 referenced ***provisional data*** were computed :
*1.2.4 - Superga steeple: Distance 5.666 NM, Azimuth 229.682°, **unrefracted** Elevation +1°54.491'*
*1.2.5 - MonViso: Distance 43.783NM, Azimuth 229.682°, **unrefracted** Elevation +2°04.869' (10.38' difference)*

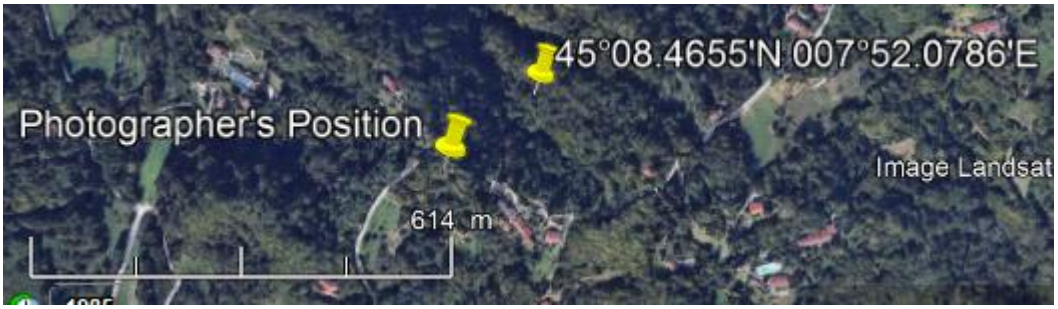
2 - From the Atmospheric refraction formulae published recently in NavList (*here* and *here*) we can *now* write:
*2.1 - With **Ve' = D NM * k/2** , k=0.18 and D = 43.7 NM, obtain **MonViso predicted vertical elevation: +3.9'***
*2.2 - With also k=0.18 and D = 5.6 NM, obtain the **Superga Steeple predicted vertical elevation: +0.5'***

3 - We then conclude that the Atmospheric refraction increases the unrefracted vertical distance between MonViso and Superga by 3.4'. With the Picture refracted vertical distance at 10'.1 we now look for a place - near position 1.2.3 - from which the unrefracted vertical distance between MonViso and Superga is close from (10.1' - 3.4') = 6.7' .

4 - In such area the ground slope is important and within a few dozen yards the unrefracted vertical distance between the Steeple and MonViso can vary significantly. Through trial and error we end up with:
4.1 - Final Position: N45°08.466' / E007°52.079' / +427m (WGS84). From this position we obtain:
4.2 - Unrefracted elevations: Superga 1°59.0' and MonViso 2°05.5' with unrefracted difference: 6.5'. And:
4.3 - Refracted elevations: Superga 1°59.5' and MonViso 2°09.4' with refracted difference: 9.9' (vs. 10'.1)

5 - From the weather at nearby ***Torino Caselle*** (AMSL +300m, WGS84 +348m), i.e. QNH=1030 mb and Temp = 10°C on that evening we retain QFE=980 mb and Temp 9°C as the prevailing values at the Observation site. Accordingly:

*While the Picture **OBSERVED Moon UL is 1.1' above MonViso,** with UL Height = 2°10.9' at UT = 17h54m15s **its COMPUTED UL is 1.5' above MonViso at 2°09.4'** . **AN ALMOST PERFECT MATCH !***



Even if the MonViso error were 0.0', it leaves a 0.4' error on the actual Moon Refraction, close to the best achievable prediction here. The actual atmosphere is therefore very close to its Standard ICAO model.

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