V. Vellucci[1,@], E. Leymarie[1], B. Gentili[1], D. Antoine[1,2]
[1]LOV, CNRS, UPMC - Villefranche-sur-mer, France ; [2]RSSRG, Curtin University - Perth, Australia ; [@]enzo@obs-vlfr.fr

A position is opened to work on improving BOUSSOLE data processing.
Please contact us if you are interested to join our team.

Shadowing corrections of BOUSSOLE radiometric measurements

1. CONTEXT

Self-shading of field radiometers is usually performed following Gordon & Ding[c] (GD).

Additional shading corrections are however needed when the radiometers are installed on large platforms[d,f] (Fig 2).

BOUSSOLE is a bio-optical mooring deployed in Case 1 waters of the NW Mediterranean Sea since September 2003[a,b,g], and which provides ocean color products for satellite cal/val activities from measurements of multi- and hyper-spectral upward radiance and irradiance and downward irradiance at 4 and 9 m depth.

A buoy-shading correction is presented here.

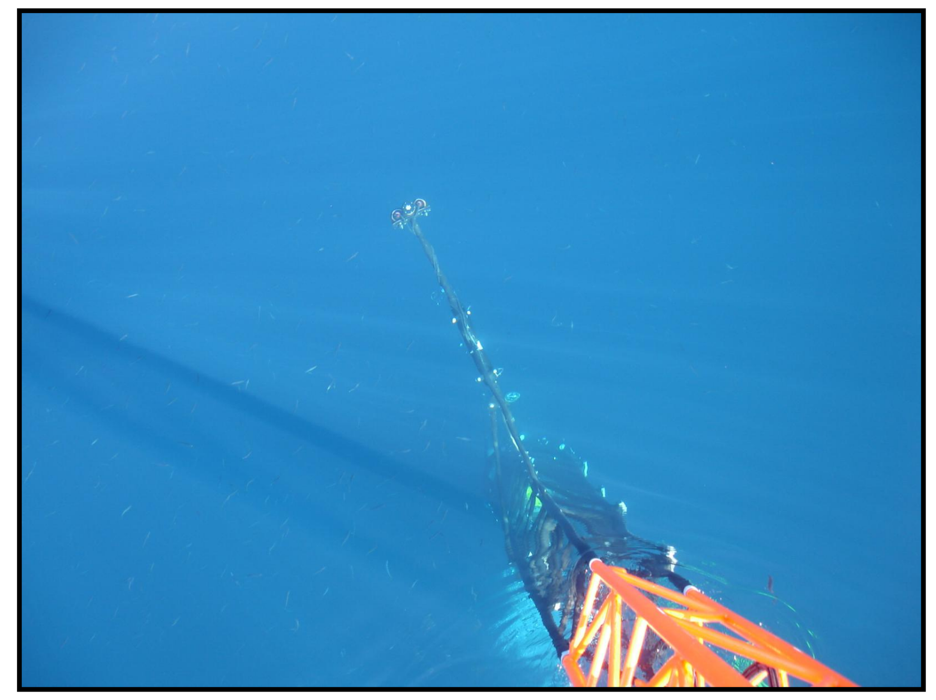

Fig. 2: Picture taken from the top of the BOUSSOLE mooring, showing the shadow of the buoy structure.

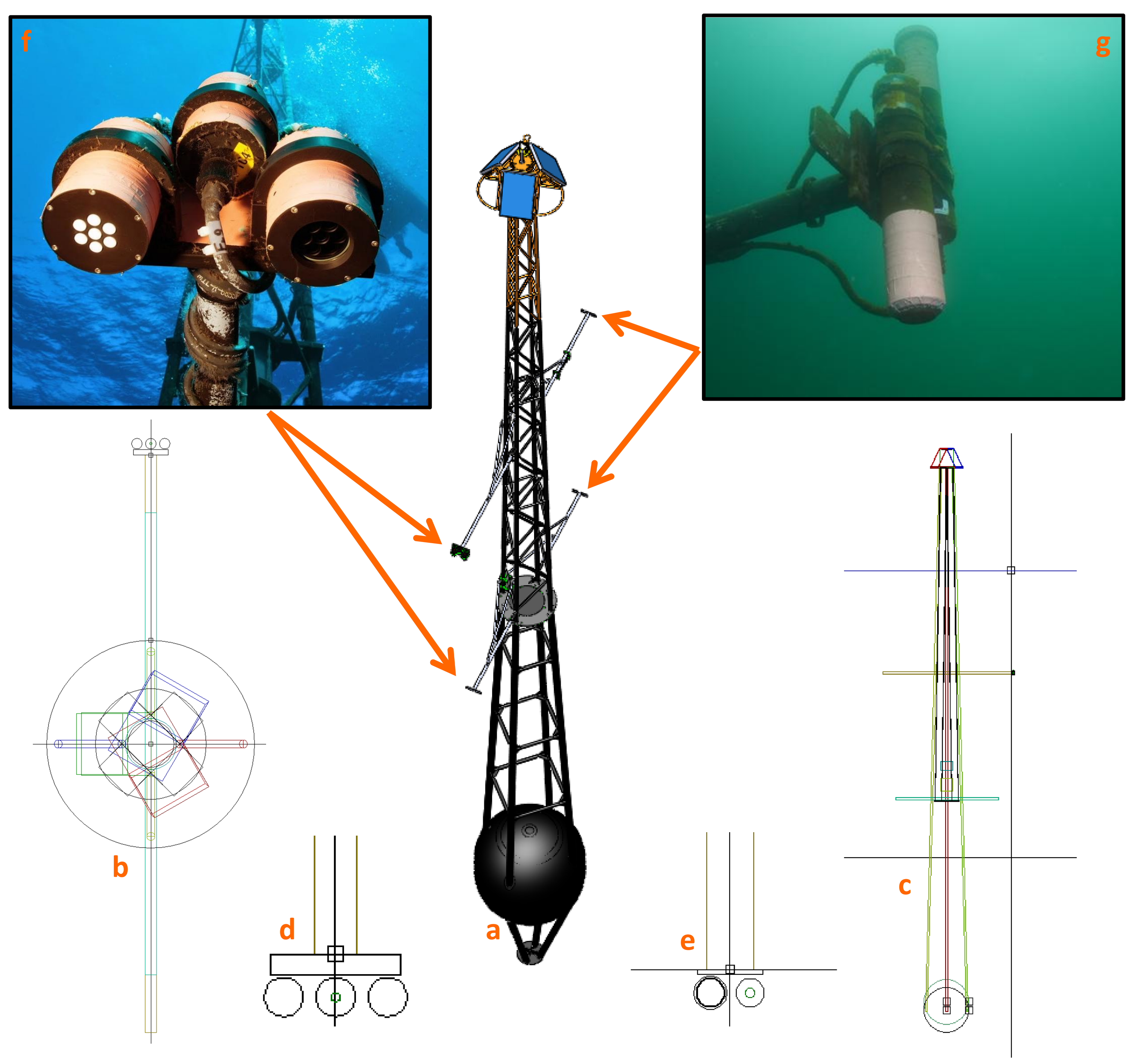

Fig. 1: 3D schema of the BOUSSOLE buoy structure (a) and different views of the model used for the *Montecarlo* simulations : top (b), side (c) and blow up of the multi- (d) and hyper- spectral (e) radiometers assemblage. Pictures of the multi- (f) and hyper-spectral (g) radiometers are also shown, arrows indicate their position on the buoy structure.

2. COMPUTATIONS

- Backward 3D *Montecarlo* simulations (SimulO)[h].
- Buoy structure and instrument assemblage specific design (Fig 1).
- Absorption and reflection properties of major elements.
- Homogeneous IOPs over depth following Morel & Maritorena[e].
- 5 TChl concentrations : 0.1, 0.5, 1.0, 5.0 µg l^{-1}.
- Azimuth angle from 0° to 360°, with 5° step.
- Zenith angle from 0° to 90°, with 5° step.
- 7 wavelengths (380, 412, 443, 490, 510, 555, 670).
- Shading lookup tables (LUT) derived for each radiometer (Fig 3).

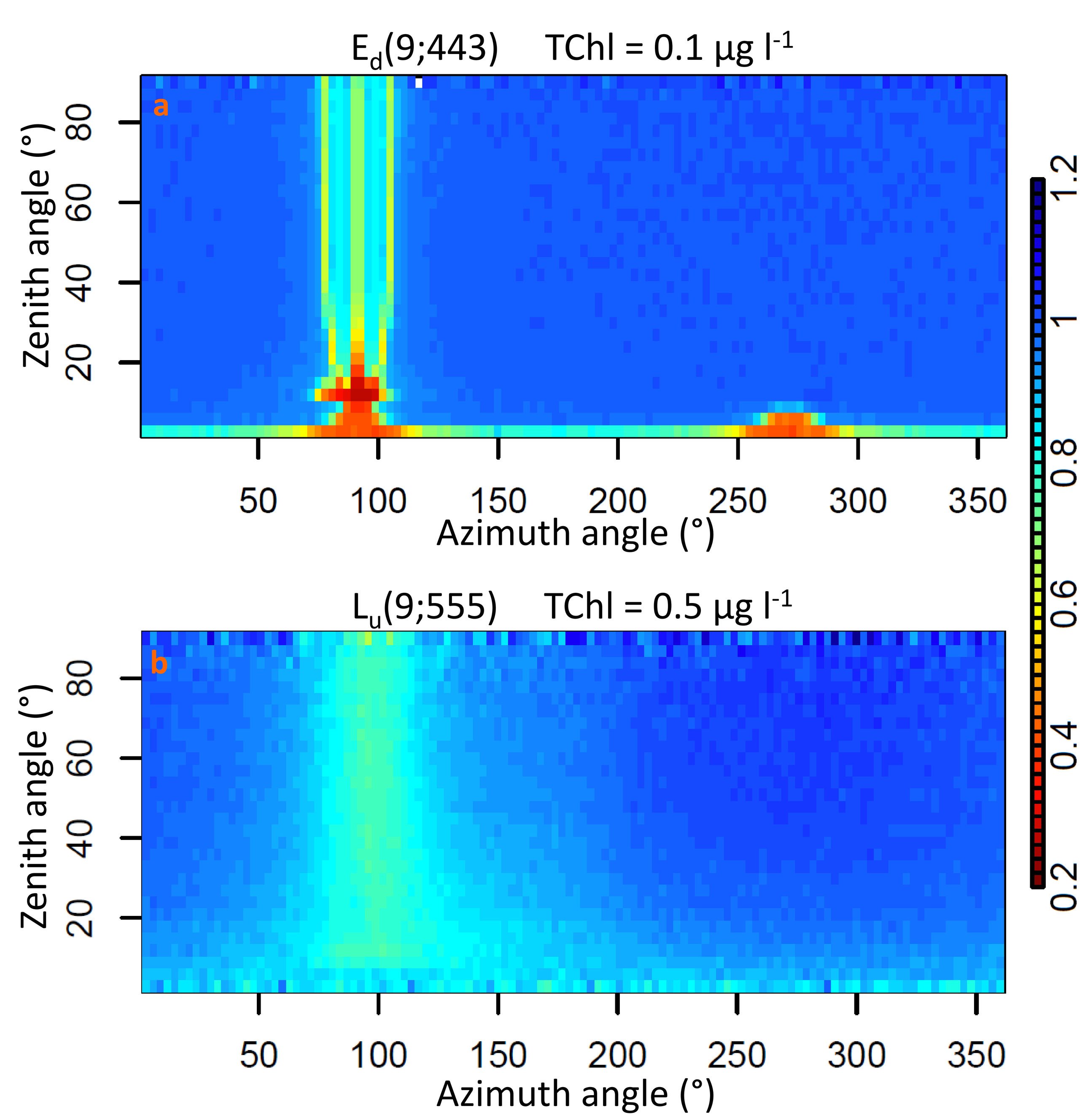

Fig. 3 : Examples of shading matrix coefficients for E_d (a) and L_u (b) at 9 m. The two main area of shading at azimuth angle around 90° are originated by the buoy superstructure. The secondary shading area for E_d at azimuth angle around 270° and low zenith angle is caused by the 4 m arm.

3. EVALUATION

The new LUT are convoluted with matrix simulating the radiant field to provide correction coefficients that replace GD in the BOUSSOLE data processing.

Examples in Fig. 4 and Fig. 5 show the effects of the new corrections.

The whole data set has been reprocessed with the new coefficients. An evaluation of their impact on the main ocean color products derived from BOUSSOLE measurements is given in Table 1.

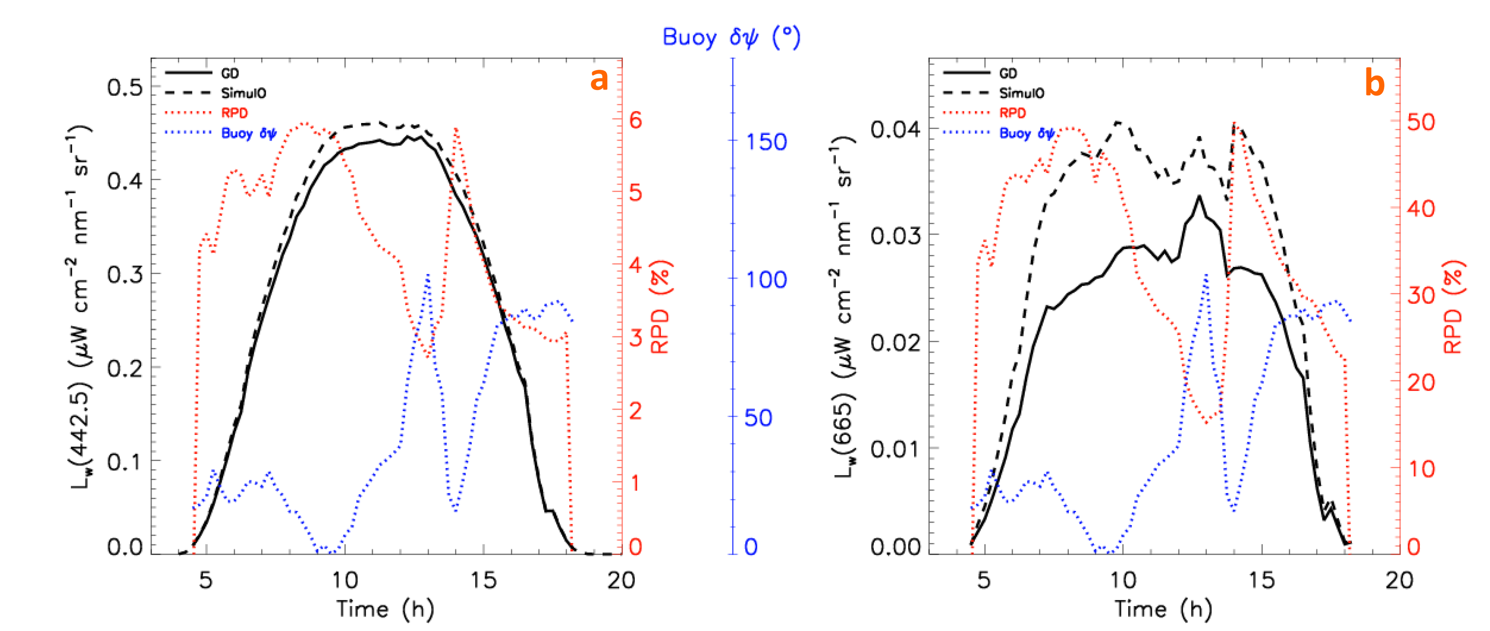

Fig. 4 : Comparison of a full day of L_w derived using the GD and the new correction coefficients at 442 nm (a) and 665 nm (b). The relative percentage deviation (RPD) and the azimuth angle (δϕ) are also shown. Zenith angle was 27.7° at noon on the selected day (03/05/2009).

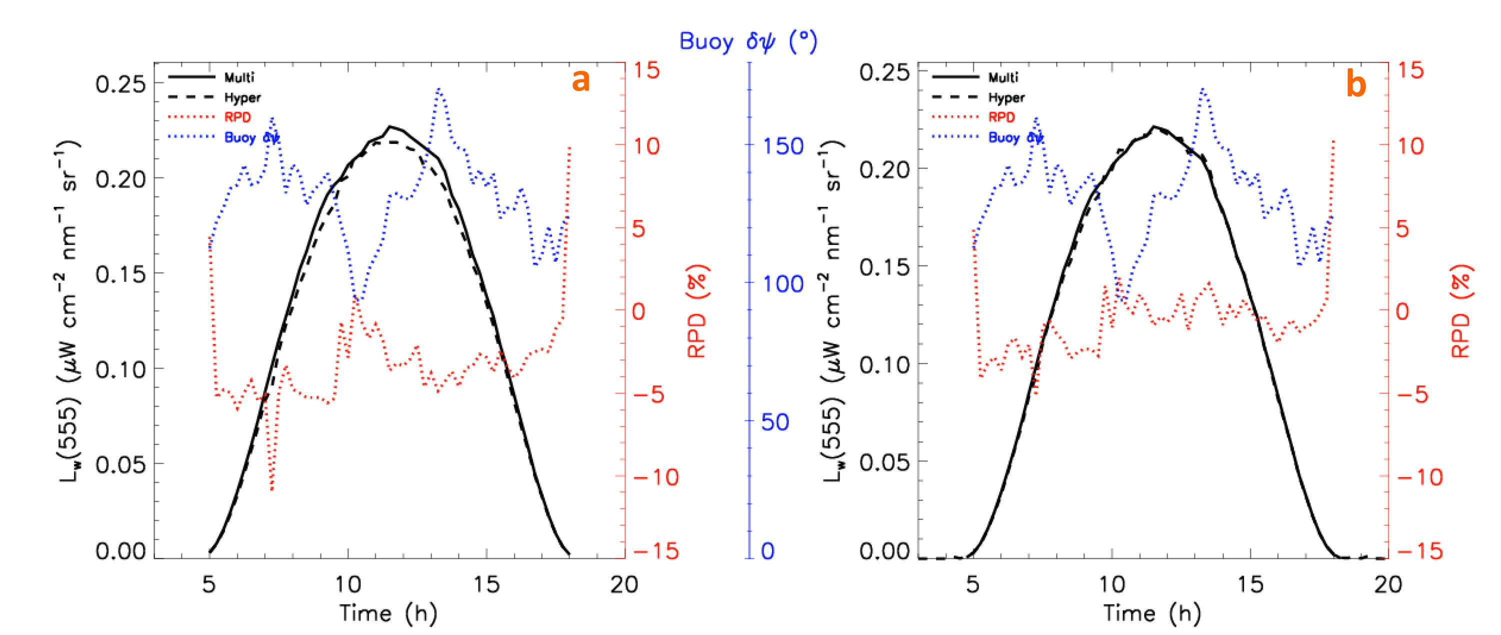

Fig. 5 : A full day of $L_w(555)$ from multi- and hyper-spectral radiometers derived using the GD (a) and the new (b) correction coefficients. RPD and are also shown (δϕ). Zenith angle was 34.9° at noon on the selected day (31/08/2010).

λ	412	443	490	510	555	560	665	670	681
N	2386	5408	5443	5471	2776	5262	3644	1442	5377
$E_u(0^-)$	2.98	2.72	2.22	1.87	1.00	1.22	4.50	3.38	11.3
L_w	4.18	3.60	2.69	2.02	1.91	2.01	20.2	10.2	9.92
Kd09	8.00	9.38	9.99	7.99	5.46	4.99	0.99	0.88	0.00
R	3.00	2.71	2.21	1.86	0.91	1.14	4.56	3.38	11.4
ρ_w	4.17	3.60	2.70	2.02	1.84	2.00	20.3	10.2	9.97

Table 1 : RPD for the main ocean color products derived from BOUSSOLE measurements processed with the two corrections. Statistics are limited to multispectral data collected between 10h and 13h UTC with surface irradiance within 20 % of its theoretical value.

REFERENCES

[a] Antoine D. *et al.*, 2006. **NASA/TM N° 2006–214147**, NASA/GSFC, Greenbelt, MD, 61pp.
[b] Antoine D. *et al.*, 2008. ***Journal of Atmospheric and Oceanic Technology***, 25, 968-989.
[c] Gordon H.R. and K. Ding, 1992. ***Limnology and Oceanography***, 37 (3), 491-500.
[d] Mueller J.L., 2007. **Final T.R. NOAA Grant NA04NES4400007**, CHORS, San Diego, 33pp.
[e] Morel A. and S. Maritorena, 2001. ***Journal of Geophysical Research***, 106, 7763-7780.
[f] Zibordi G., J.P. Doyle, S. Hooker, 1999. ***Journal of Atmospheric and Oceanic Technology***.
[g] http://www.obs-vlfr.fr/Boussole/
[h] http://www.obs-vlfr.fr/LOV/OMT/SimulO/index.htm

Visit stands #2015 #2019 #2085 & #2122 for other posters on BOUSSOLE.

ACKNOWLEDGEMENTS