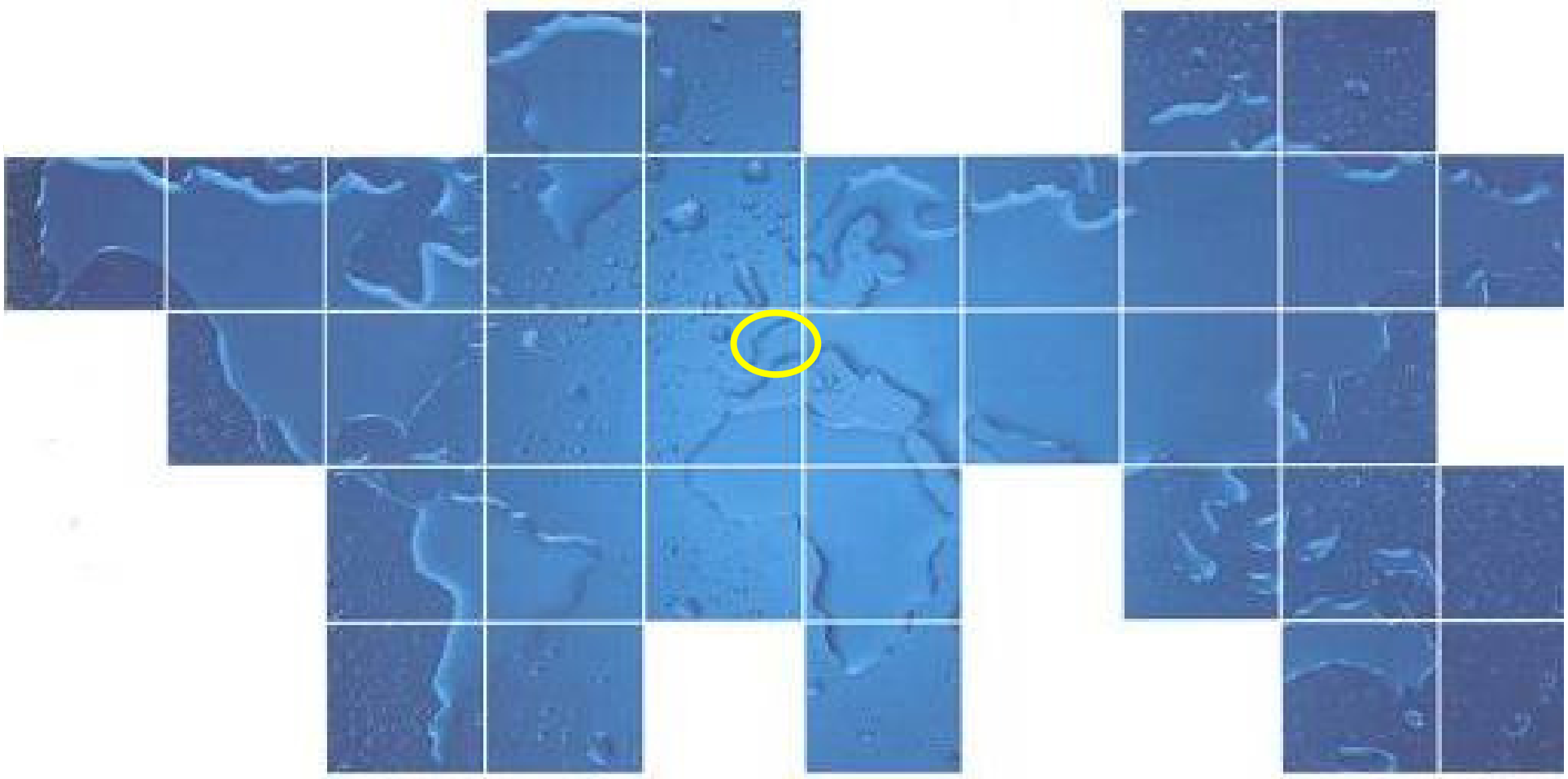
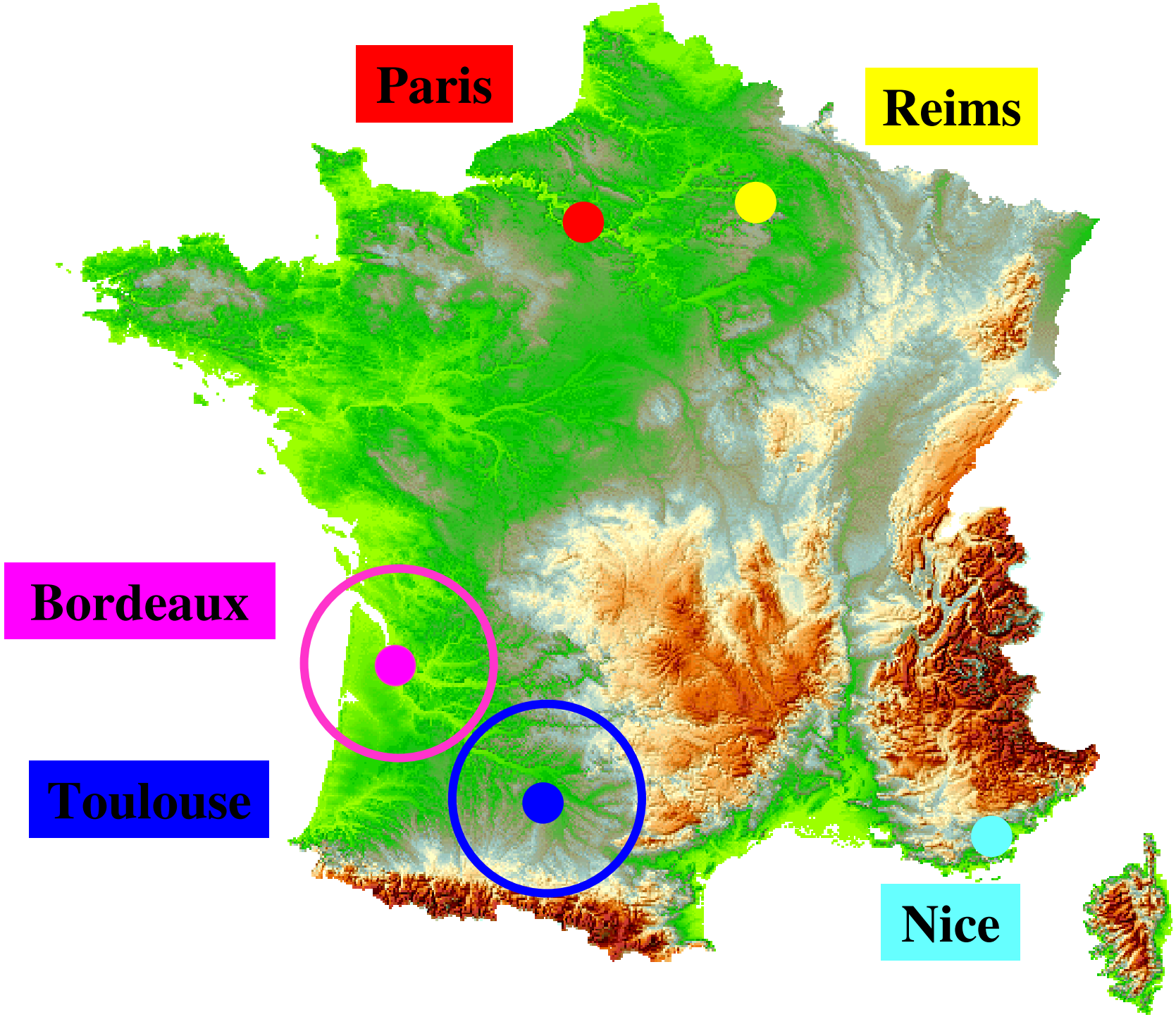
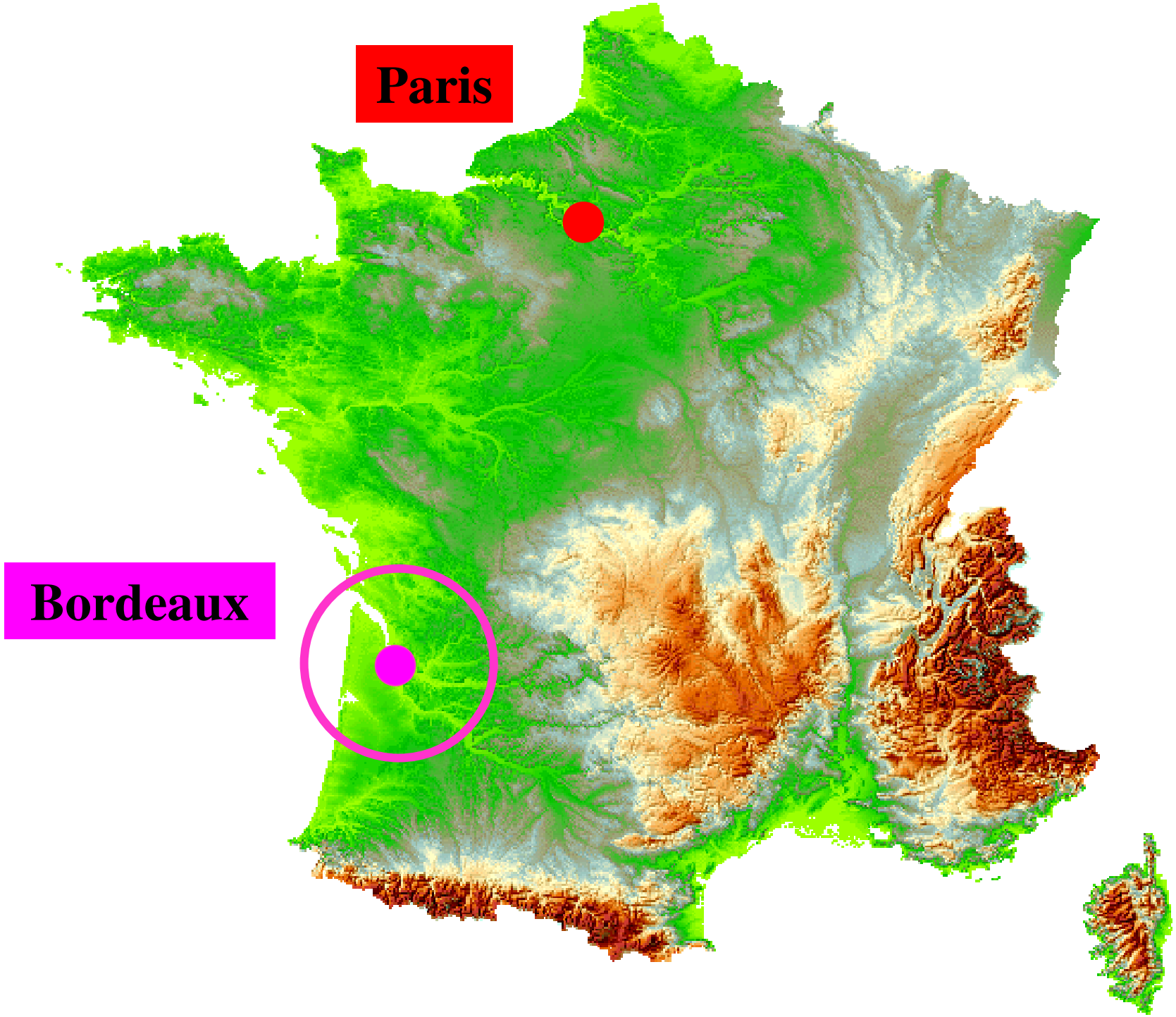

CALIPSO
CALISPH'AIR
calisph'air
cnes




cnes
Alisph'air


Paris
Reims
Bordeaux
Toulouse
Nice

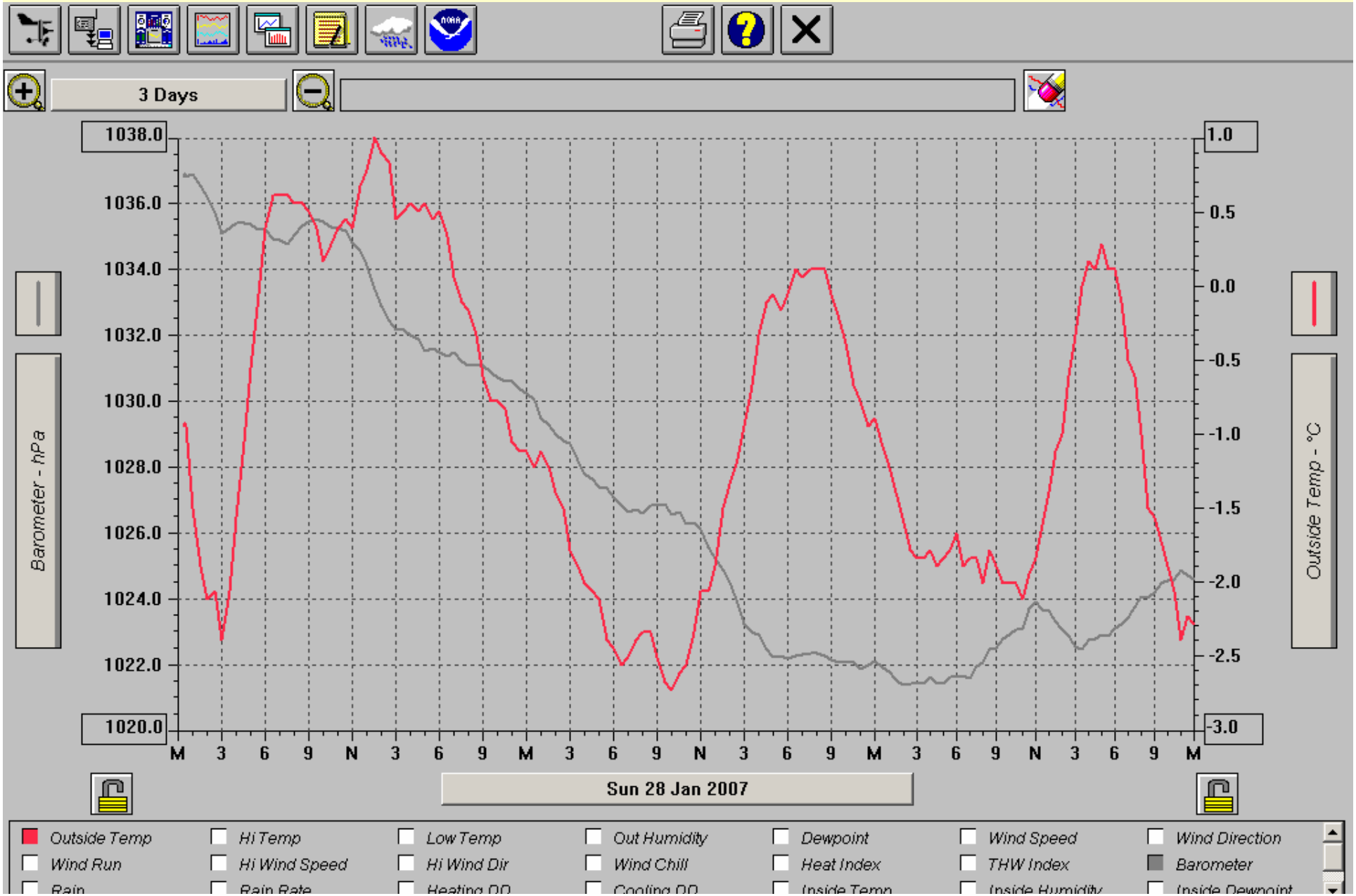

Paris
Bordeaux

Lycée Palissy à Agen

Le montage de la station météo et sa situation

L’estimation de la couverture nuageuse et sa nature

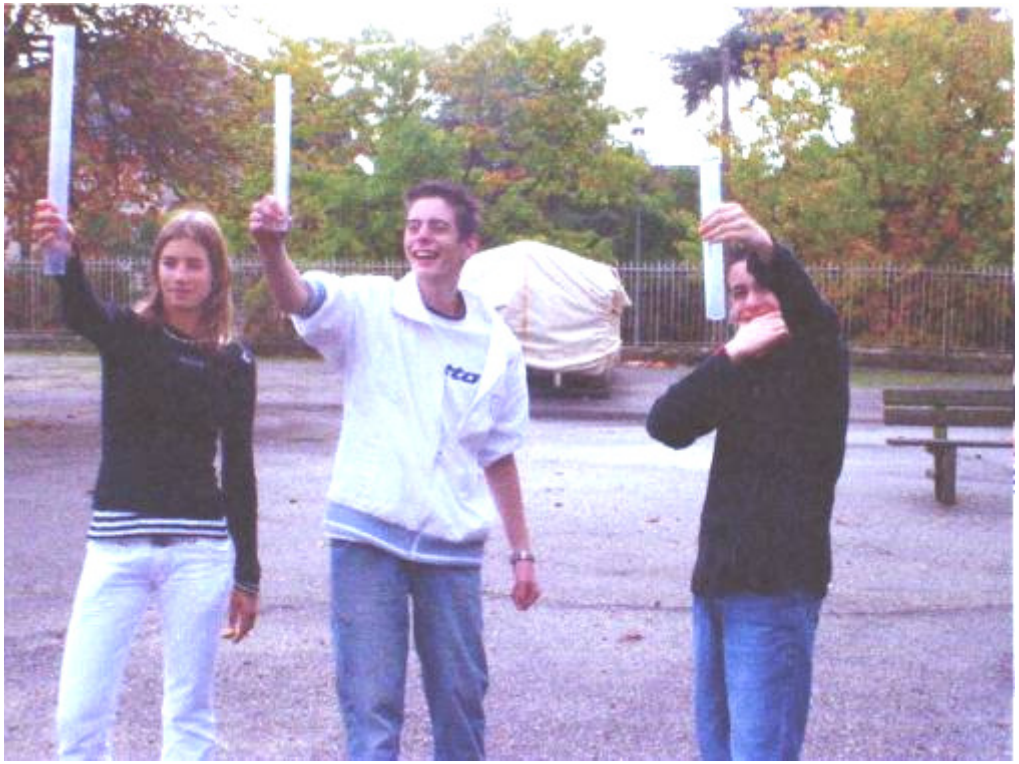
Nos premiers enregistrements..



PROJET CALIPSO : Mesure des bâtiments

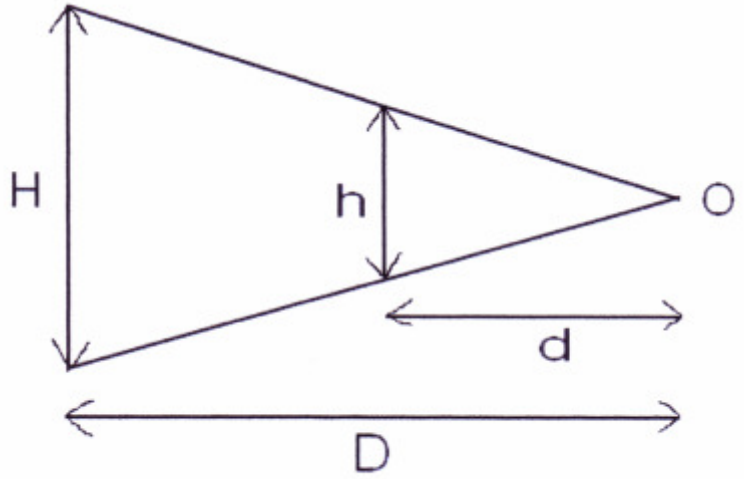
Dans le cadre du projet Calipso, nous avons mesuré la hauteur des bâtiments situés à côté de la station météo.

PROJET CALIPSO : Mesure des bâtiments



Pour cela, nous avons utilisé la technique de la visée, c'est-à-dire à l'aide d'une simple règle. Dans un premier temps, il a fallu mesurer la hauteur apparente du bâtiment en lisant les graduations de la règle.

Nous avons ensuite construit une « figure géométrique de Thalès ». Nous avons pris en compte deux rayons lumineux issus de l'objet vers l'oeil ainsi que deux droites parallèles entre elles.



Schématisation de la visée

On est sur O. On cherche H.
On a h = graduations de la règle soit 17 cm.
On mesure d = longueur du bras. On trouve 71 cm.

PROJET CALIPSO : Mesure des bâtiments

On mesure ensuite D = distance entre le bâtiment et 0. Pour cela, on utilise un mètre.

On trouve D = 55,30 m soit 5530 cm. A l'aide des ces mesures, on applique le théorème de Thalès : h/H=d/D soit H = h x D / d H = 17 x 5530 / 71 H = 94010 / 71 H = 1324 cm soit 13,24 m

Ainsi, on a calculé la hauteur du bâtiment annexe à la station météo qui est de 13,24 mètres.

Et quelques travaux en anglais réalisés par les élèves présentant le programme Globe, les paramètres atmosphériques….

Anaïs et Léa : The globe program

Capucine et Amandine : Low-level clouds

Adrien et Jérôme : Low-level clouds

Guillaume et Adrien : The ozone layer

Marine et Elise : La transparence de l'atmosphère

Marion et Marina : High-level clouds

Mathieu et Thibault : Cloud cover and contrails

Sandra et Pauline : Mid-level clouds

Sarah et Sophie : Surface ozone

Marion et Marjorie : Test about the Calipso project

Claire et Alexandre : The weather tools use in the CALIPSO project

Collège Cantelande à Cestas

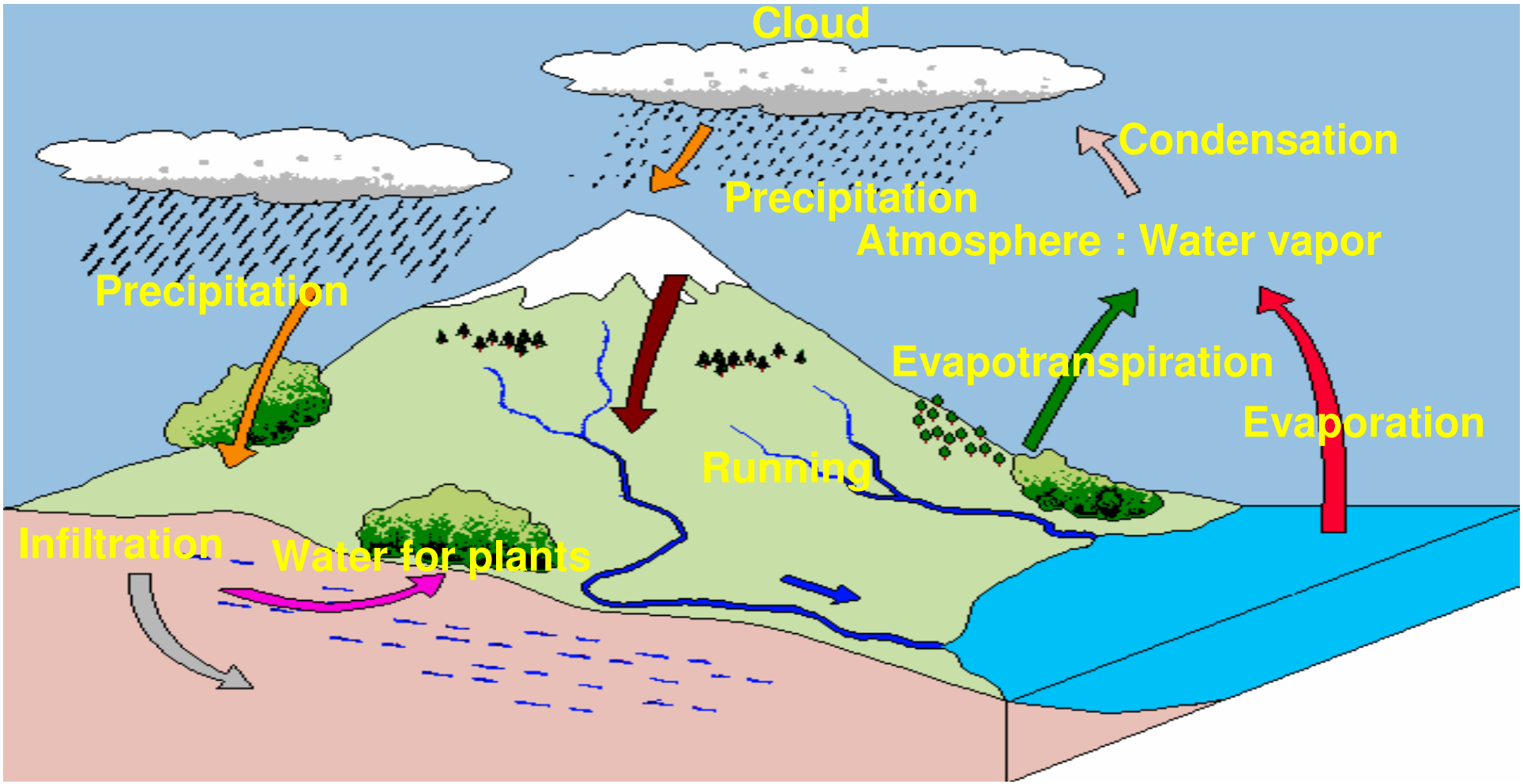
Atelier de pratique scientifique

COLLEGE CANTELANDE Cestas

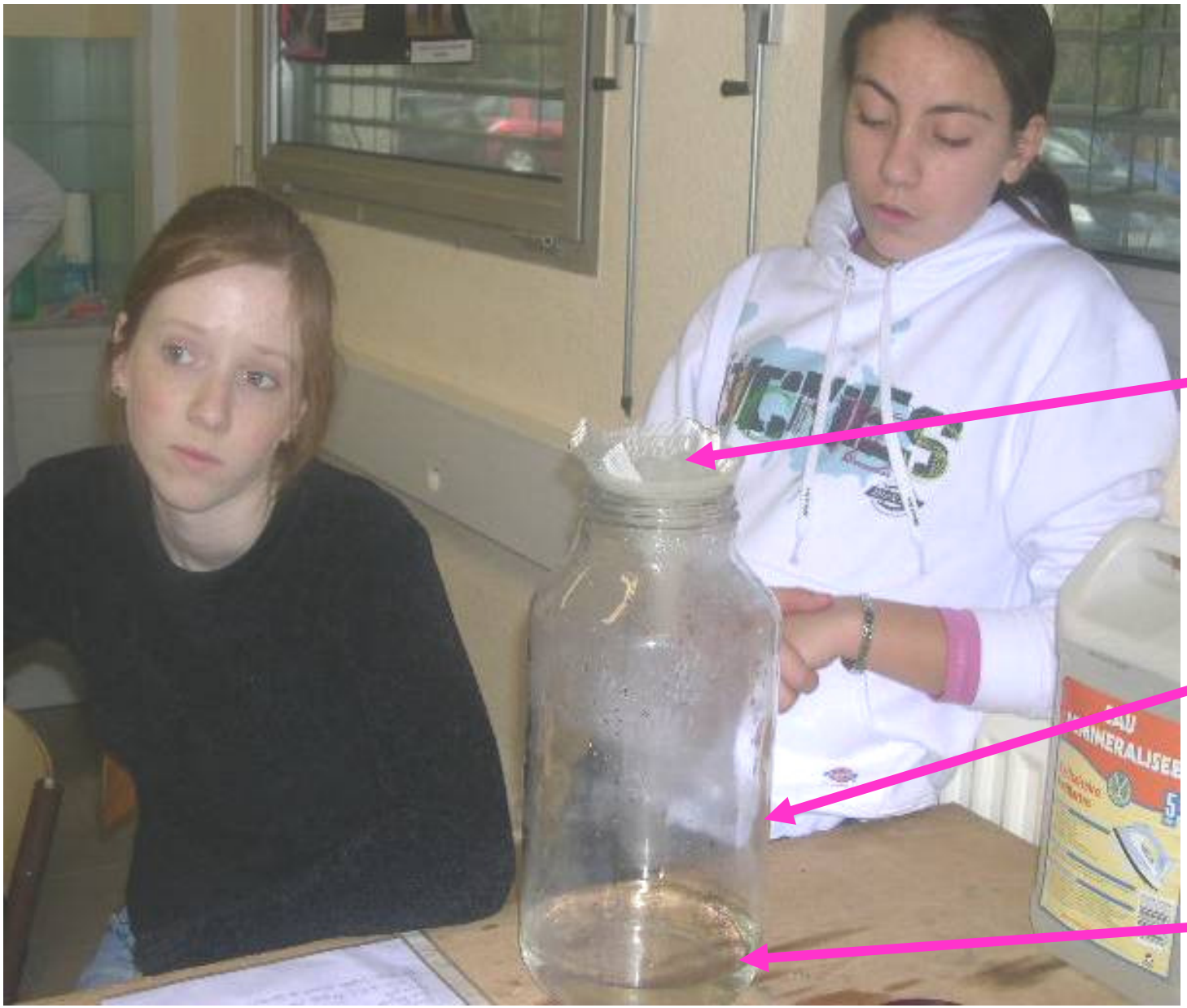
An example of the study of clouds and their impact on the climate, carried out by the students of the *Atelier de Pratique Scientifique* in the *Collège Cantelande* in Cestas.

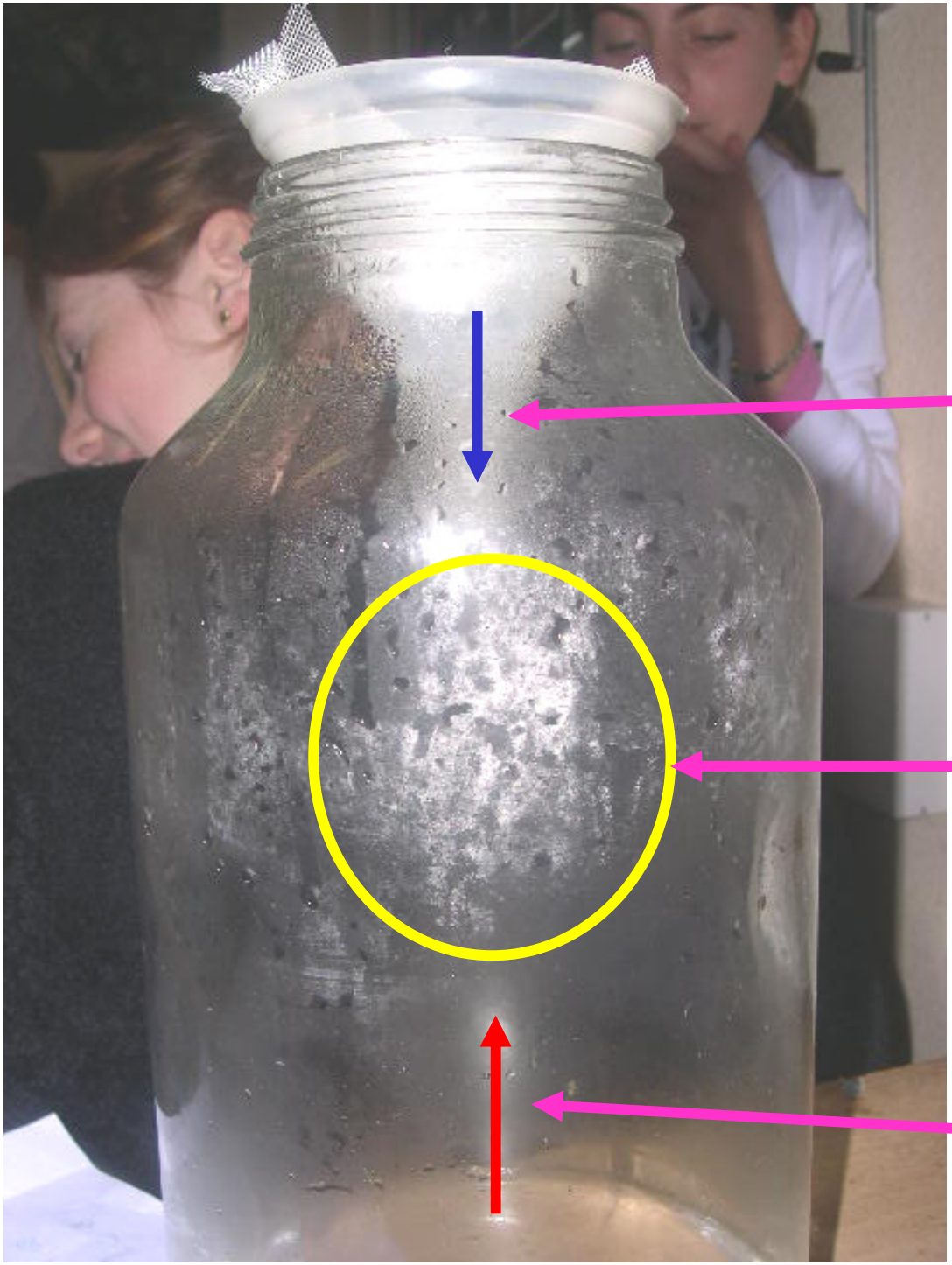
What did we learn about the clouds ?

The water cycle

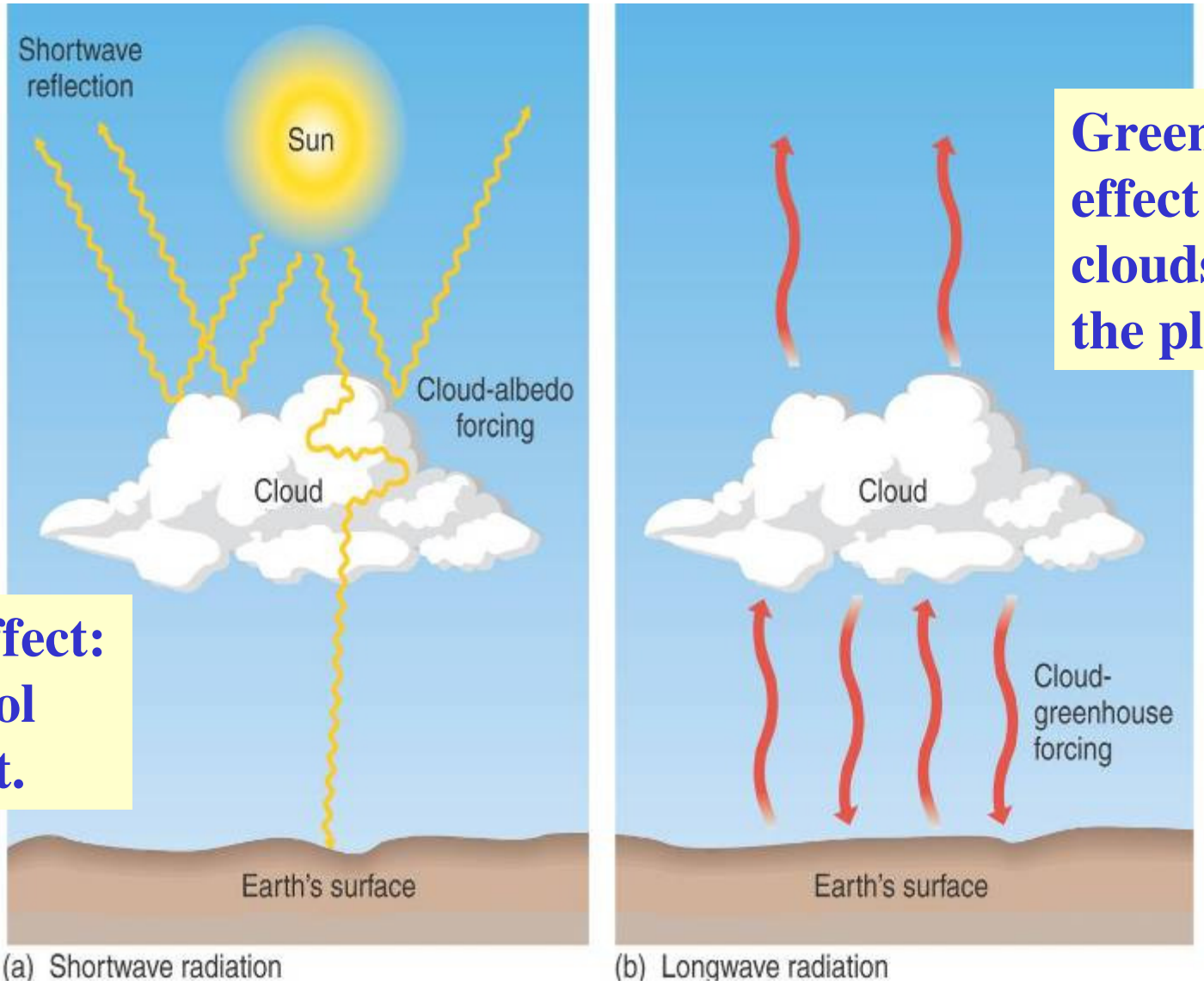


Experiment : fog formation




Cold air goes down
Here you can see some fog !
Hot air goes up

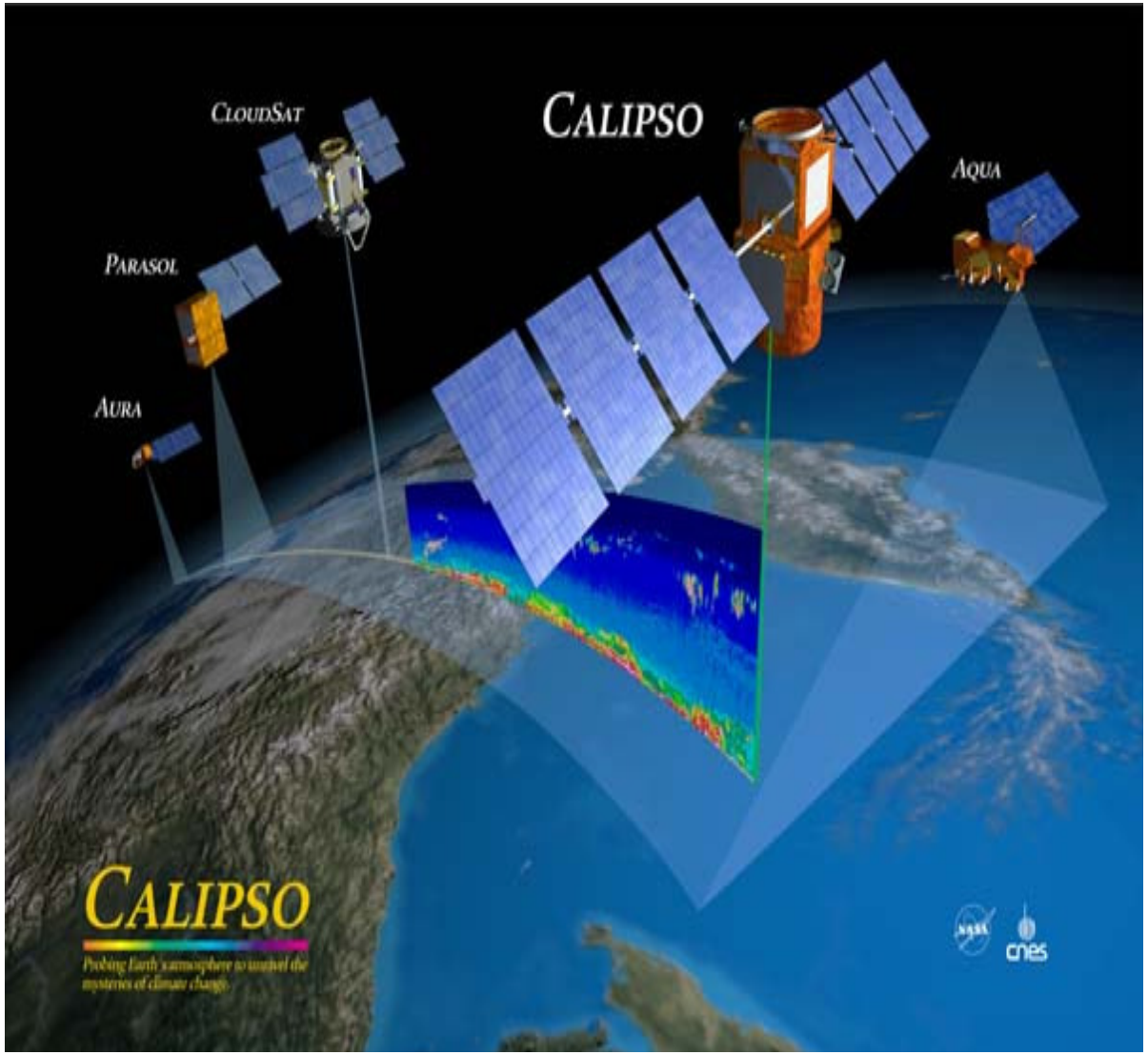
What did we learn about the clouds ? Their impact on the climate



Albedo effect: clouds cool the planet.

Greenhouse effect : clouds warm the planet

CALIPSO will improve our understanding of climate change

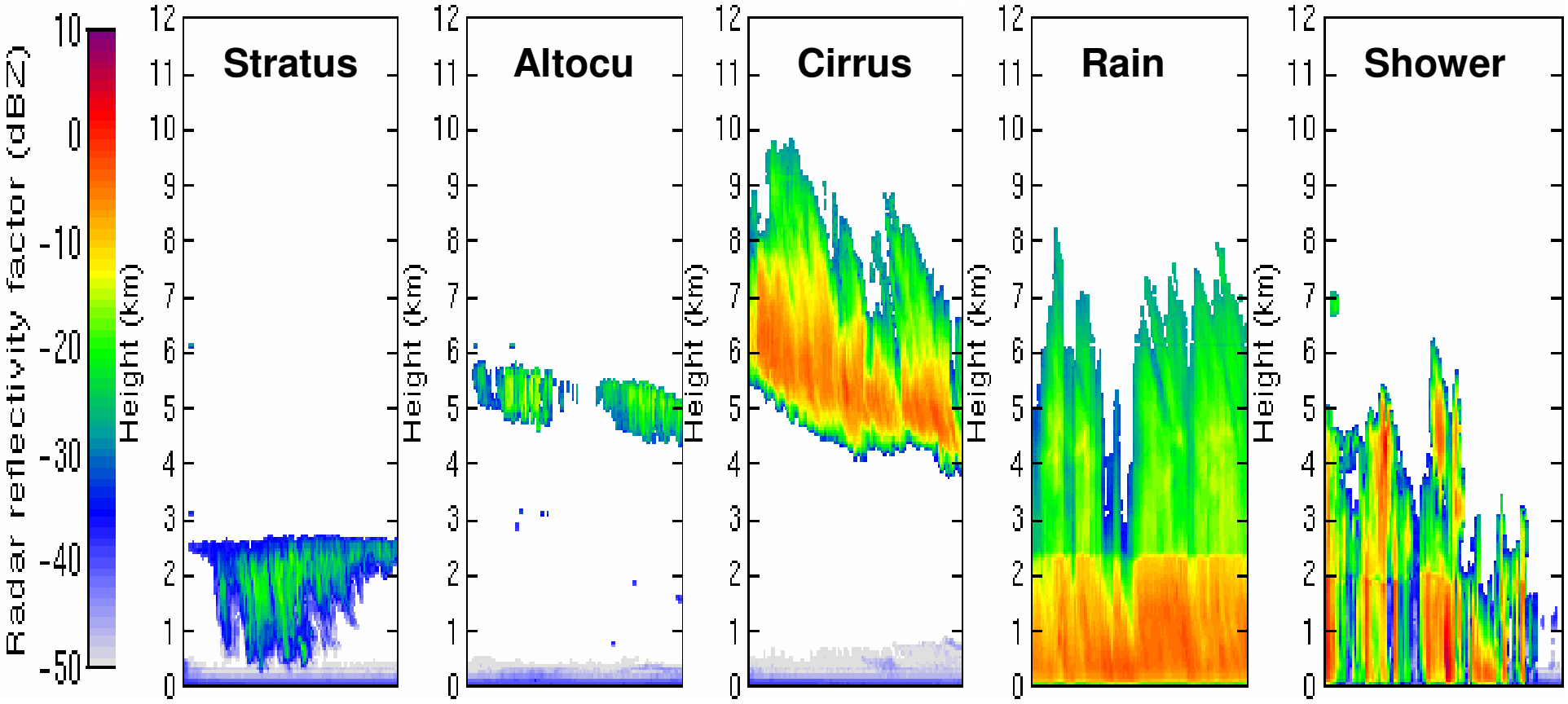


CALIPSO will significantly improve our understanding of both direct and indirect forcing effects on climate.

Both students and scientists will contribute to this important research.

CALIPSO will provide global measurements of aerosols and clouds

Vertically resolved measurements are necessary to understand the effects of aerosols on clouds.



Collège André Lahaye à Andernos

AEROSOLS
ET
PHOTOMETRIE

LES AEROSOLS NATURELS

Ils proviennent :

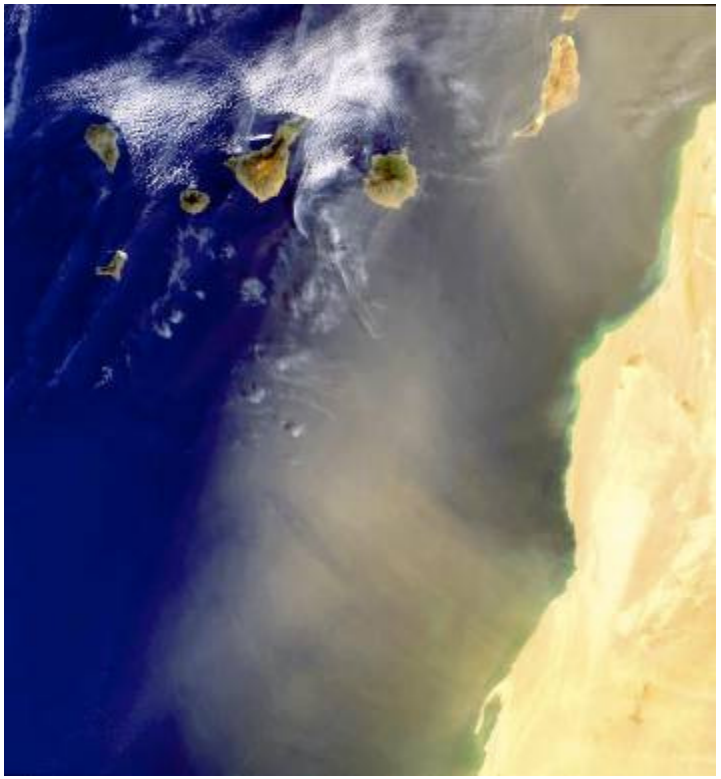
- Des océans :
  - sels de mer produits par l'évaporation des embruns
  - sulfates provenant de l'oxydation de composés soufrés (sulfure de diméthyle) émis par le plancton
- Des continents :
  - poussières terrigènes (d'origine minérale,

  arrachées au sol)

  soulevées par l'érosion éolienne
  - carbone sous forme minérale ou organique (suies)

  produit par les feux de forêt ou de savane déclenchés

  par la foudre
  - poussières et sulfates volcaniques.



Source ENVISAT / MERIS (Sahara 2003)

LES AEROSOLS ANTHROPIQUES

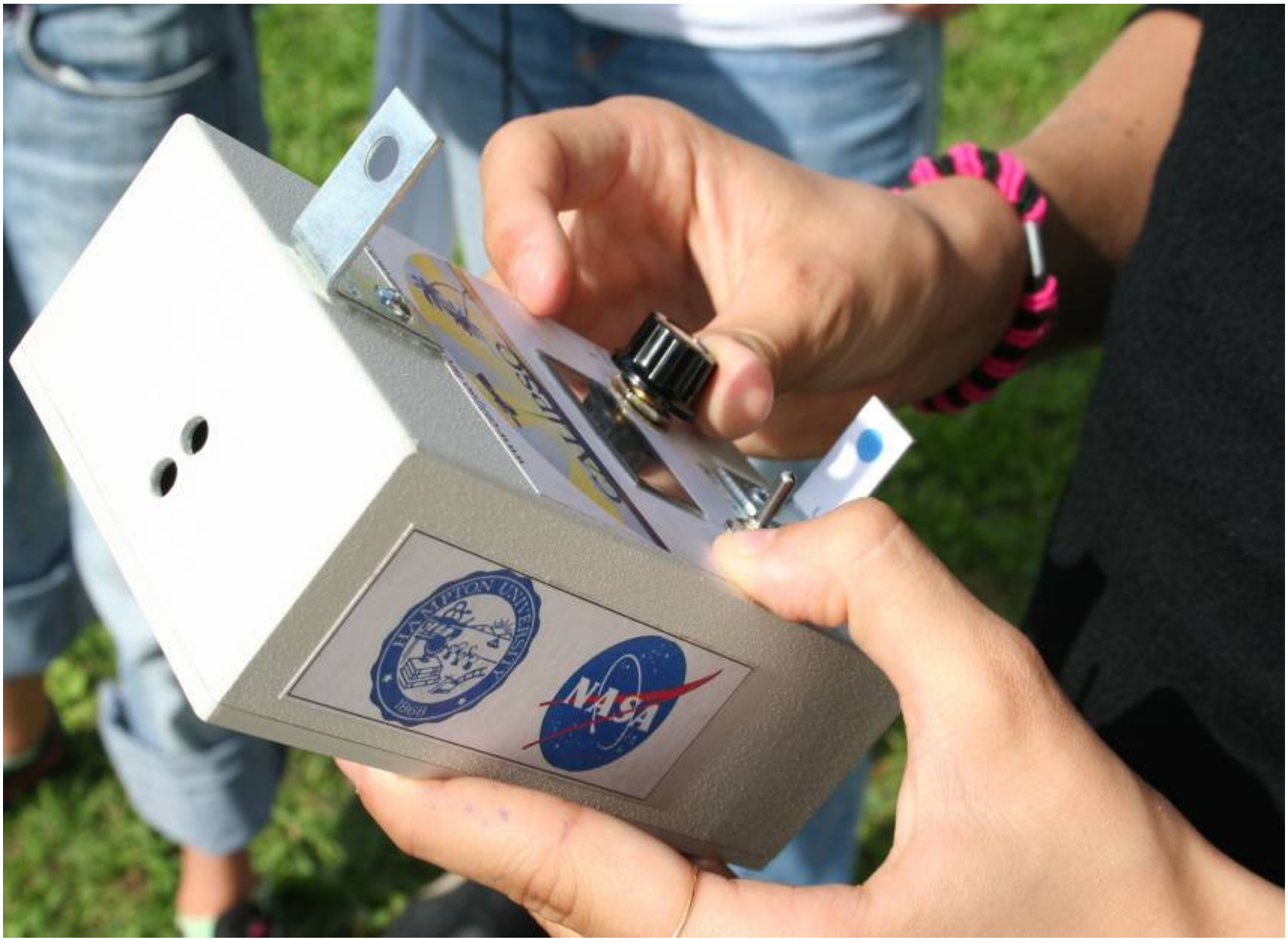
Ils sont générés par :

- la mise à nu des sols, qui favorise leur érosion par le vent
- les diverses combustions pour l'industrie, le transport.

Les feux pour les pratiques agricoles produisent des aérosols carbonés, tandis que les rejets atmosphériques de soufre produisent des aérosols de sulfates.

Feux en Australie 07 décembre 2006
Source ENVISAT /MERIS

MEASURES



Lycée Eiffel à Bordeaux

Ballons sondes

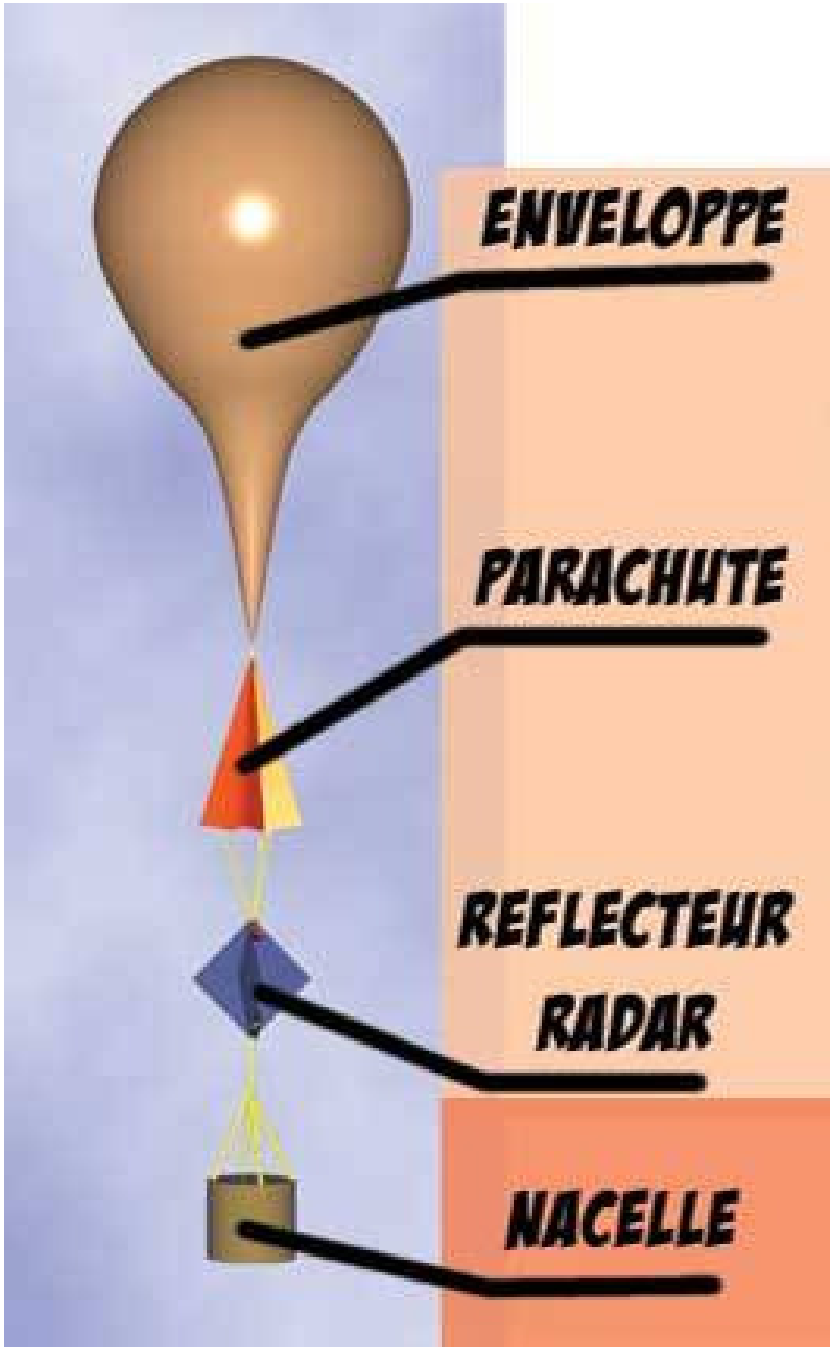


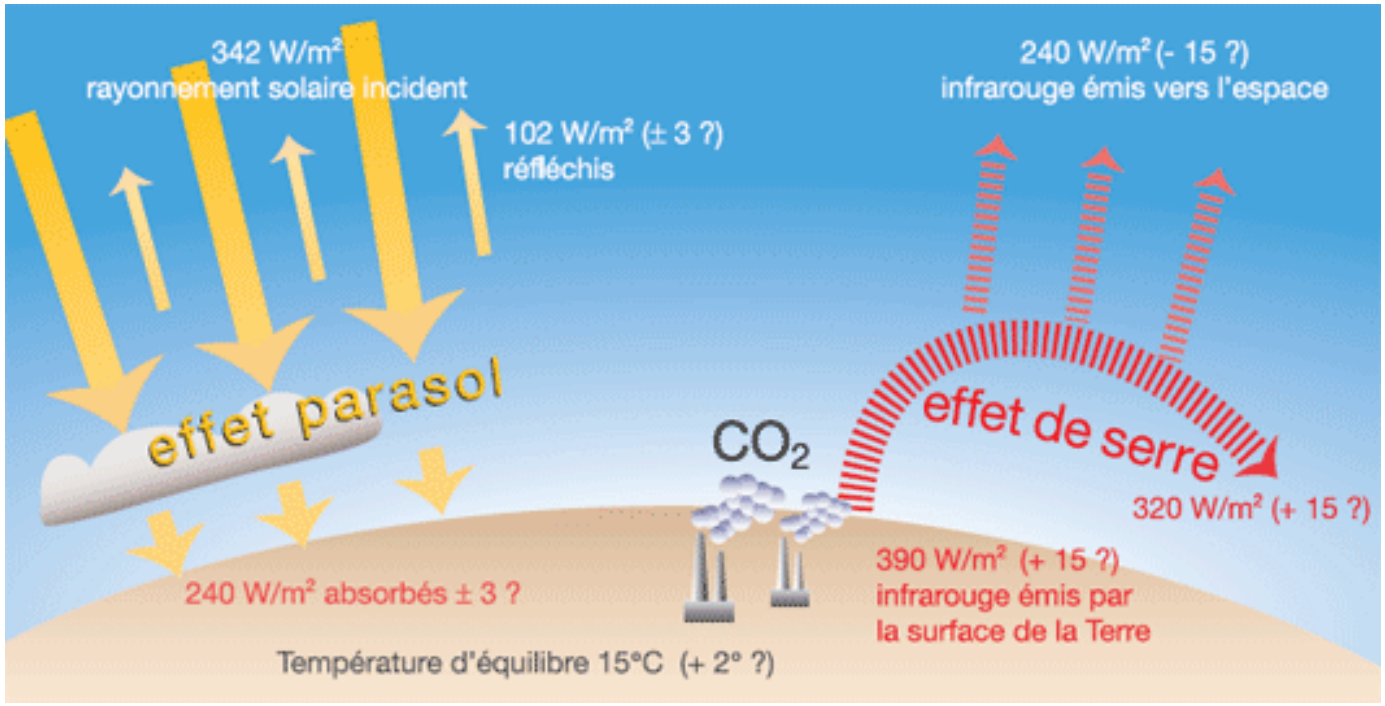
Schéma d'un ballon sonde

Experiment

The Global Warming

The factors

- **Greenhouse effect**
- **Parasol effect**
- **Human activity**



The Global Warming

Consequences :

Physics :

- Rise of water
- Increase in moisture
- Strong precipitations
- Amplifications of the climatical phenomena

Biology :

-Species in the process

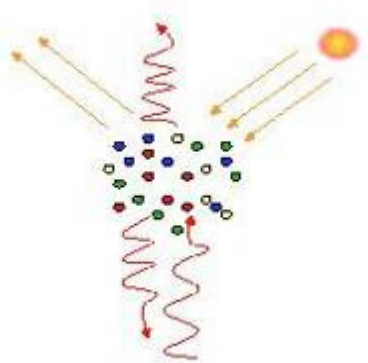
-of disappearance

AEROSOLS

Several millions of tones are emitted every day from different sources natural and human.

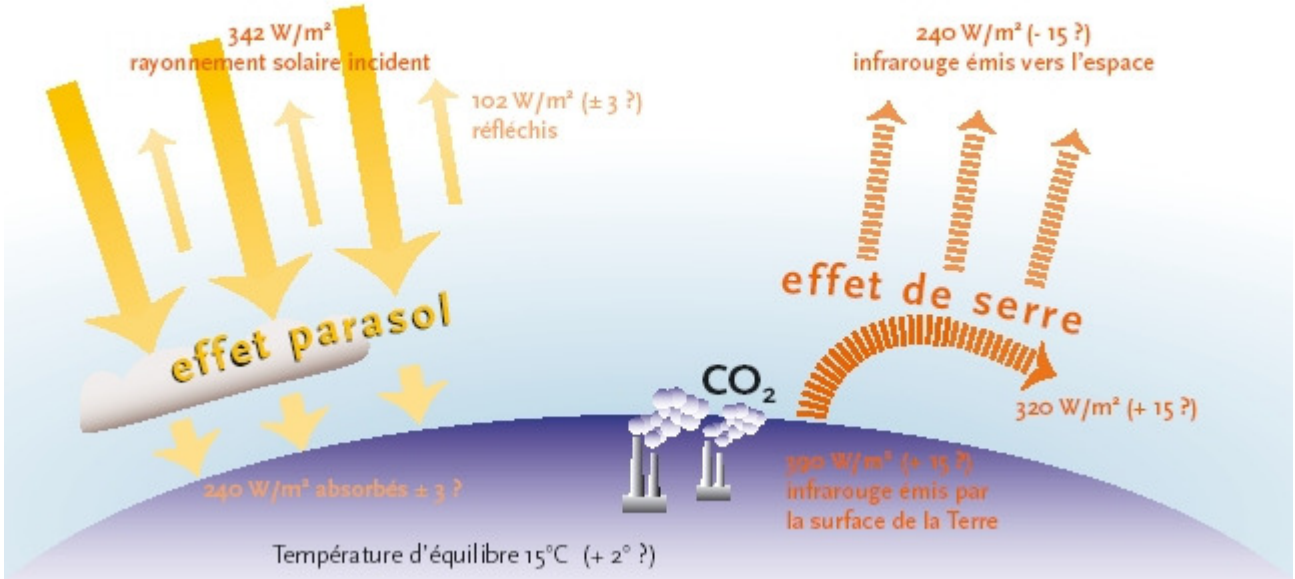
The warming due to greenhouse gases is modulated by the aerosols effect.

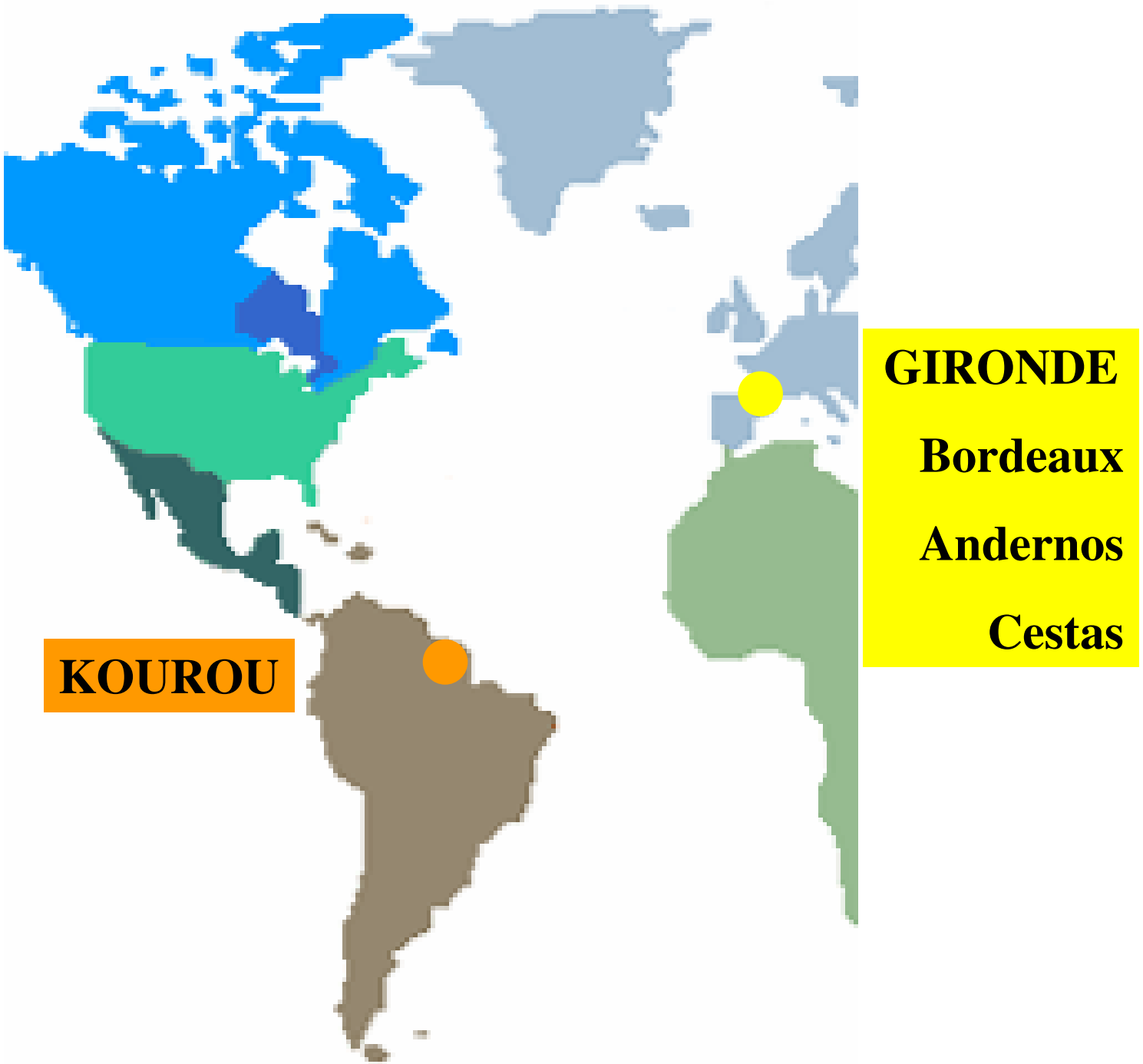
This effect is direct by reflection toward the space of a part of the solar radiation or indirect due to their influence on the cloud optic properties.



AEROSOLS

- **In average, aerosols have a parasol effect, they reduce solar energy quantity coming over the floor.**
- **Because of the aerosols, drops are smaller, they will precipitate less and the average of the cloud life expectancy will augment : the average cloud cover will be more important on the Earth.**




GIRONDE
Bordeaux
Andernos
Cestas
KOUROU

C2-BACK Network

Communauté

Calisph'air

Bordeaux

Andernos

Cestas

Kourou

BORDEAUX - ANDERNOS - CESTAS - KOUROU

C2-BACK

C2-BACK Network

The aims :

Organising cooperation between middle school and high scool to collect data.

Building methods to exchange, compare and analyse these data.

Fiche de relevé de données C2-BACK

Informations générales :

Nom de l'établissement :

Noms des observateurs :

Date :

Heure :

Mesures de base :

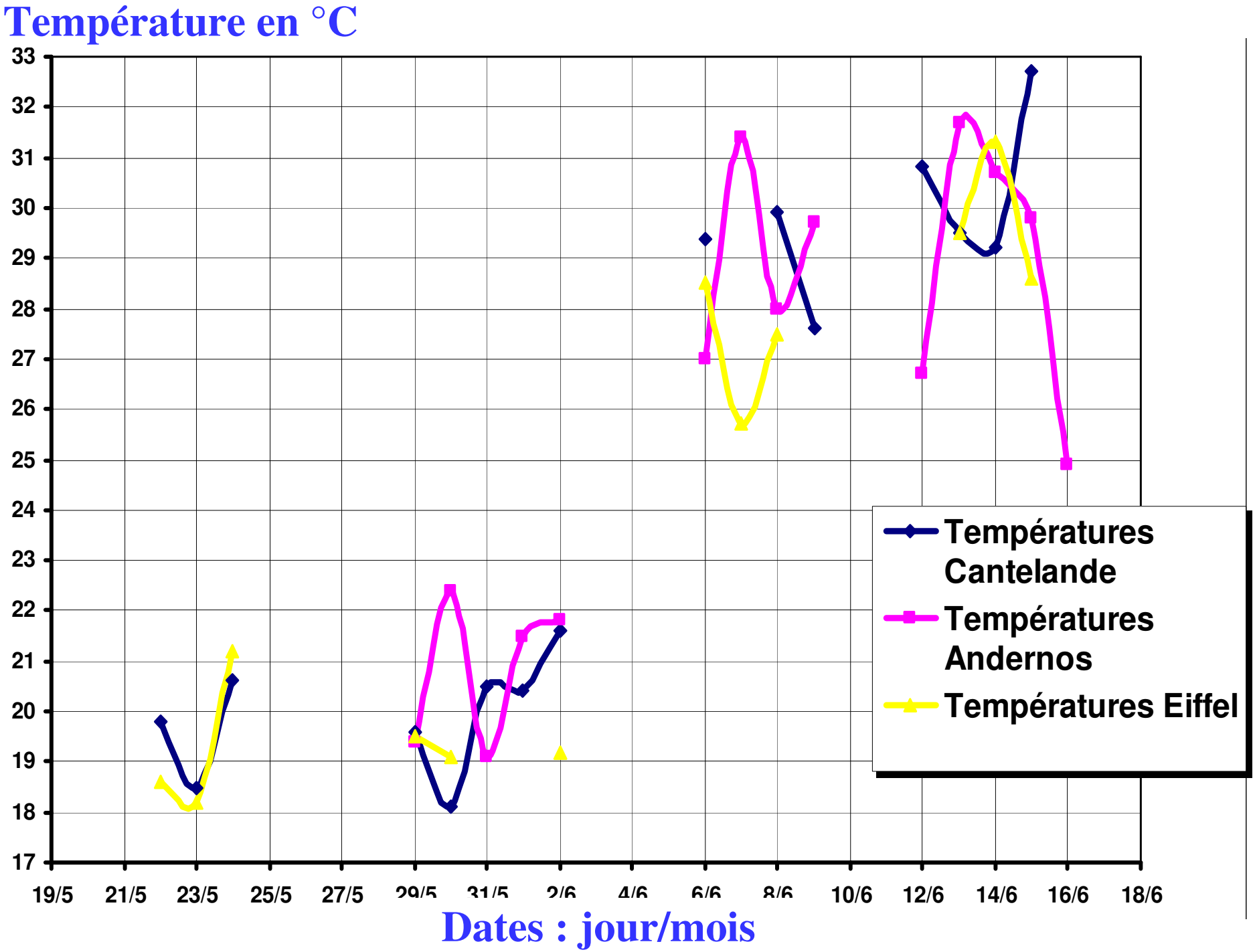
Température de l'air (°C)	
Pression atmosphérique	
Pluviométrie (mm)	
pH de l'eau de pluie (unité pH)	

Mesures photométriques

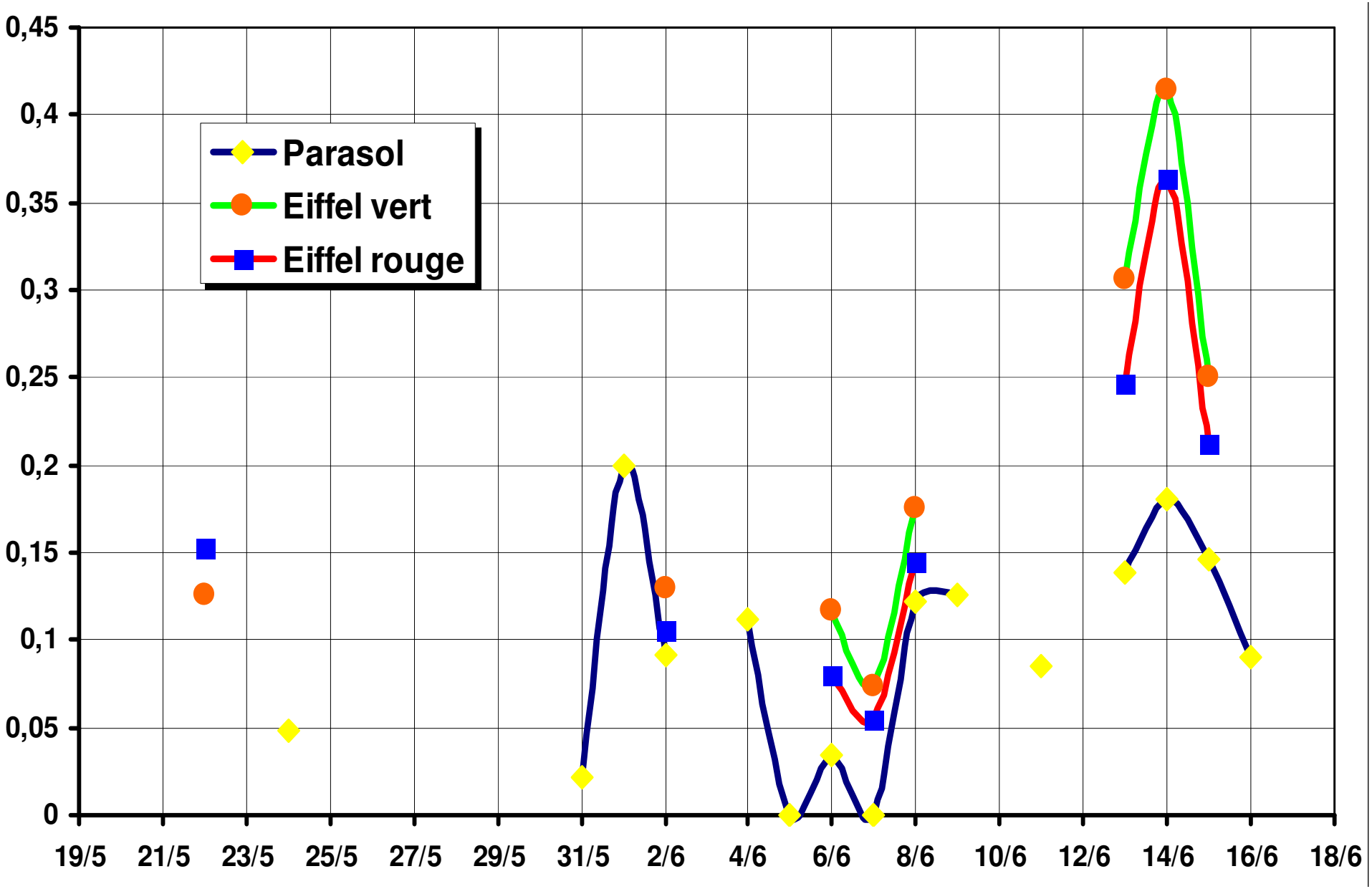
Numéro de la mesure[1]	tension maximale au soleil[4] (volts)	tension "obscure"[5] (volts)	T	Au moins trois séries de mesures sont nécessaires [4] Reportez toujours les tensions avec 3 chiffres significatifs après la virgule. Par exemple : 1,773 est préférable à 1,77. [5] La tension "obscure" est la valeur mesuré lorsque le photomètre (les deux trous situés sur la face supérieure) est occultée avec la main[1]
1 (verte)				
1 (rouge)				
2 (verte)				
2 (rouge)				
3 (verte)				
3 (rouge)				

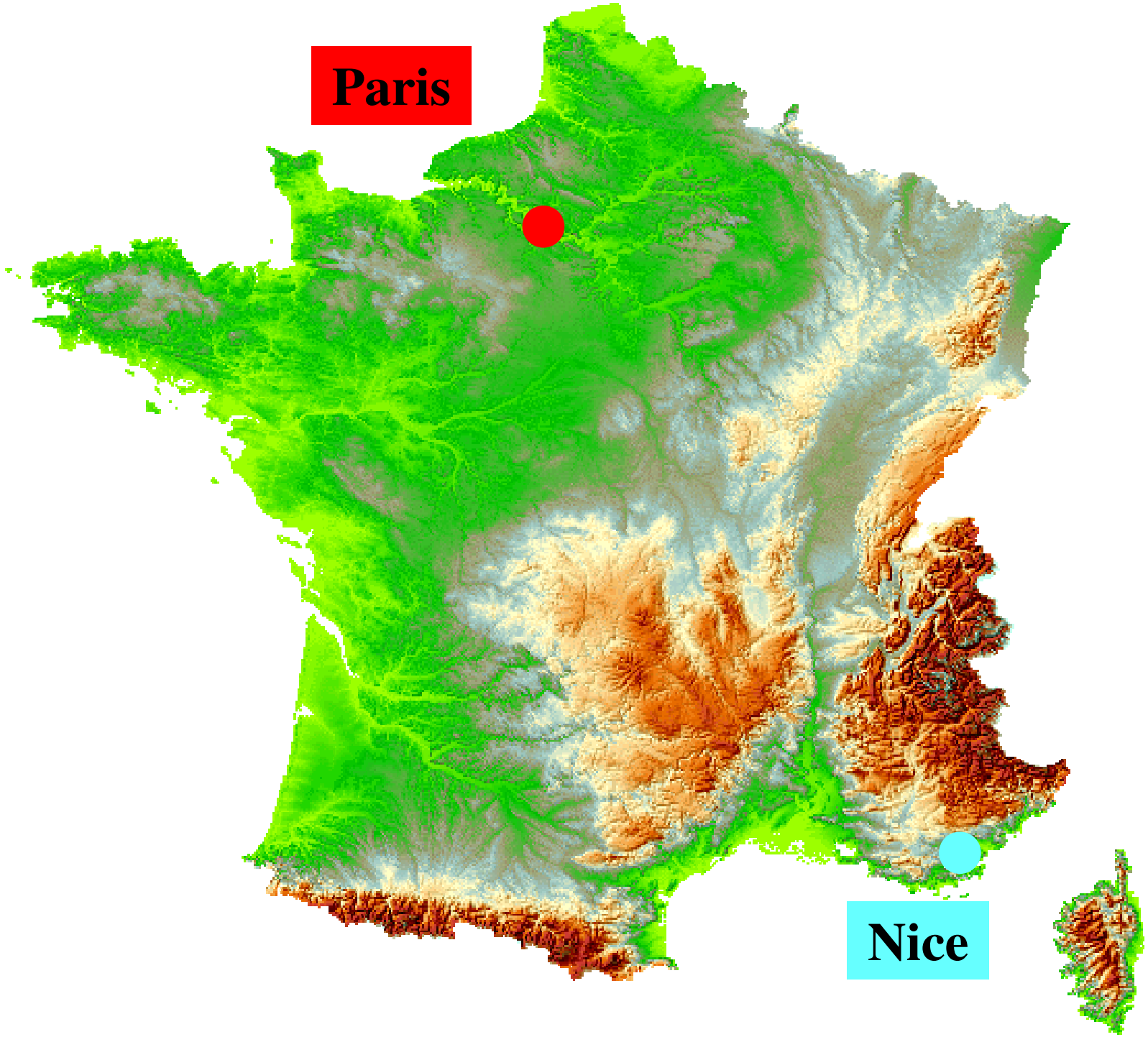
Mesures ozone atmosphérique :

Valeur mesurée (en ppb)	


Température en °C
33
32
31
30
29
28
27
26
25
24
23
22
21
20
19
18
17
19/5
21/5
23/5
25/5
27/5
29/5
31/5
2/6
4/6
6/6
8/6
10/6
12/6
14/6
16/6
18/6
Dates : jour/mois
Températures Cantelande
Températures Andernos
Températures Eiffel

Epaisseur optique - AOT




Paris
Nice

Collège
La Chênaie
à Mouans
Sartoux

Projet Calisph'air

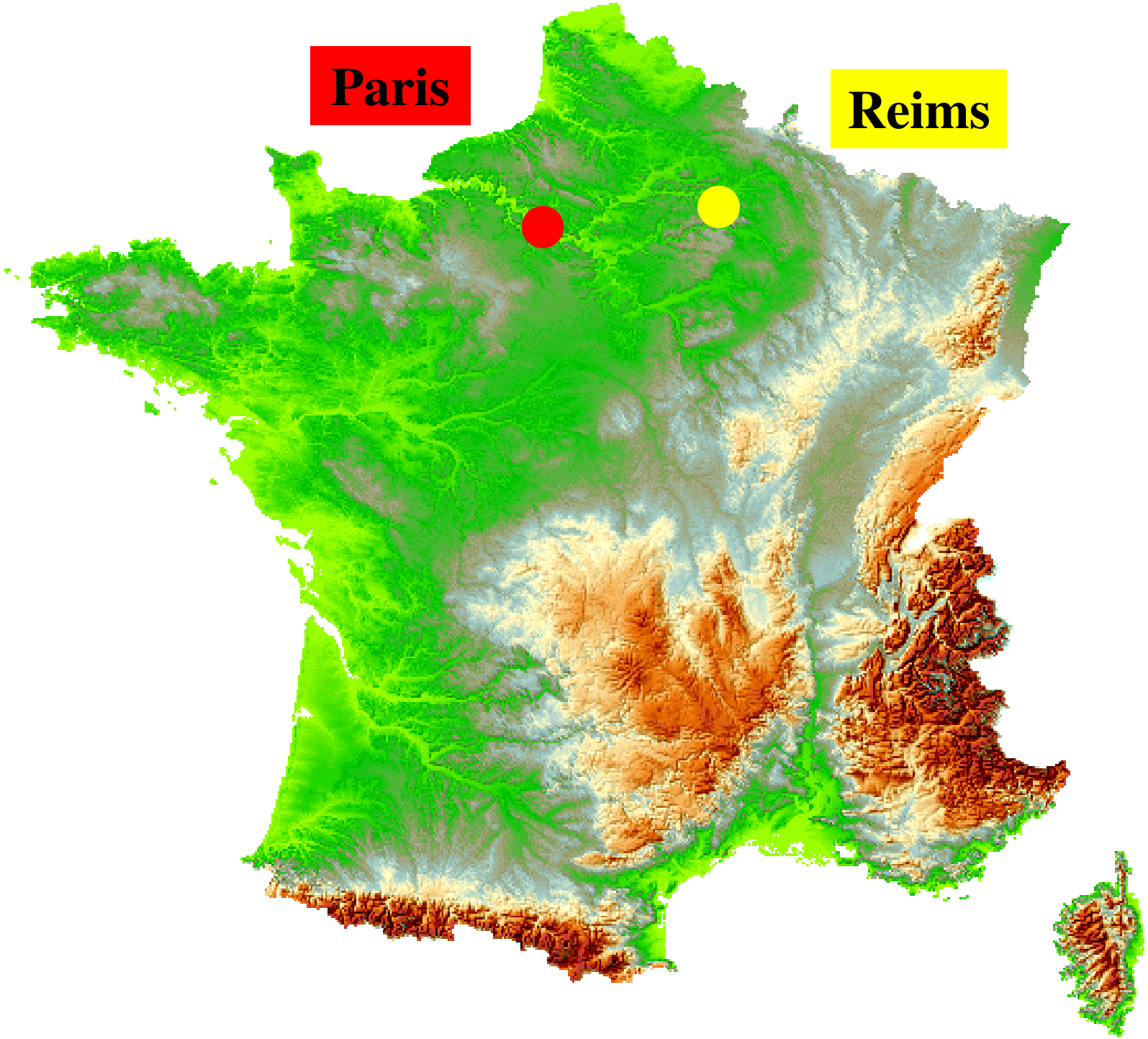
Niveau 4ème:

Notre objectif: étude de la pollution engendrée par les aérosols et par l'ozone de surface sur notre atmosphère direct.

Nous souhaitons durant la deuxième partie de cette année:

* Détermination de l'épaisseur de la couverture nuageuse,
* Connaître la nature des divers aérosols présents dans notre atmosphère direct,
* Déterminer la présence ou l'absence d'ozone de surface dans notre atmosphère direct par le biais de bio-indicateurs tels les pieds de tabac,
* Observer directement le ciel et l'atmosphère (remplissage des fiches de relevés Globe),
* Mettre, ensuite, en ligne ces données sur le site de Calisph'air du CNES.

Pour ce faire, nous avions besoin de mettre en place des connaissances. Nous nous sommes servis des diverses expériences présentées par nos partenaires américains et les avons modelées sous forme de travaux pratiques d'investigation.


Paris
Reims

Lycée Roosevelt à Reims

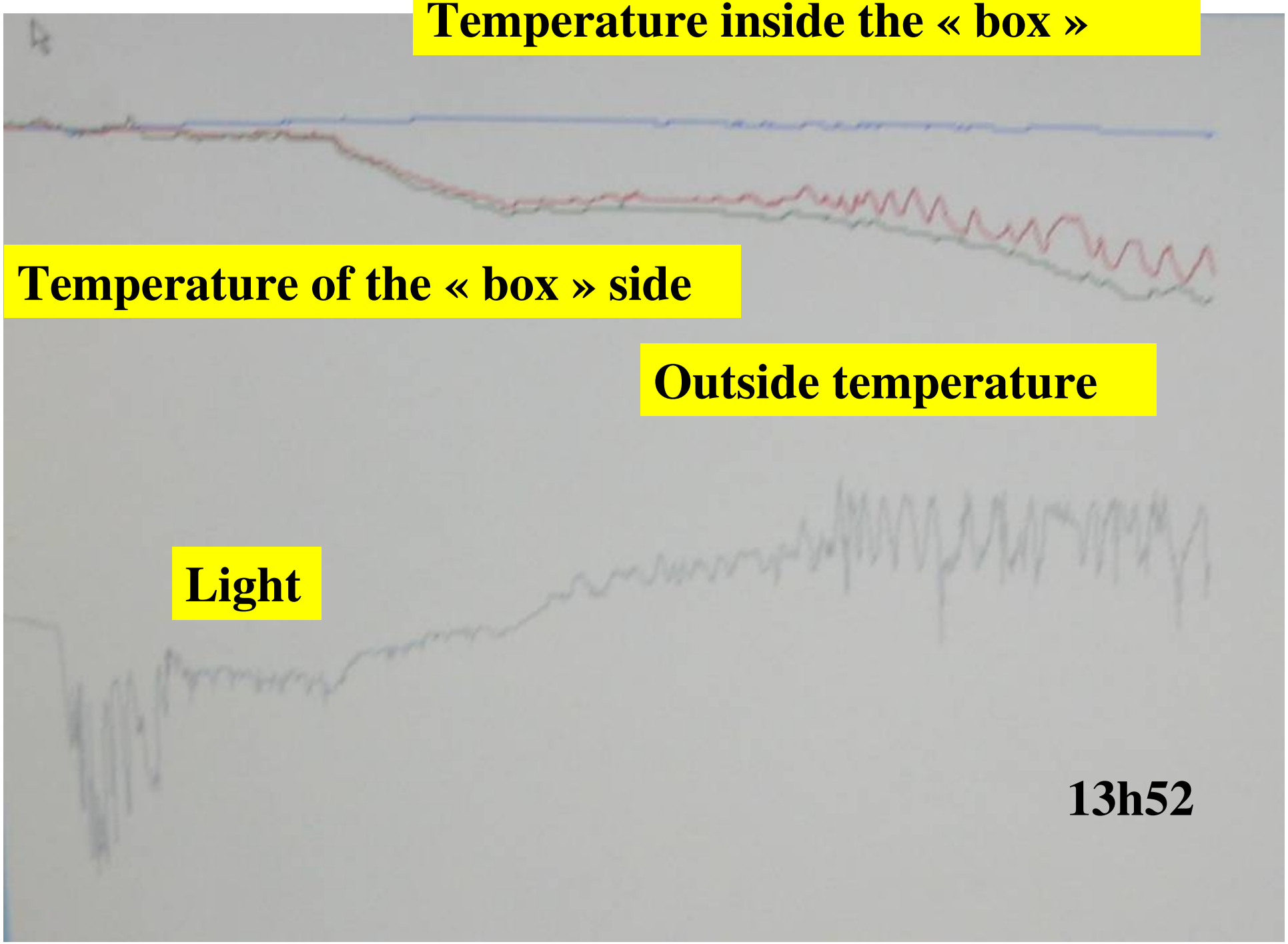
Atmospheric measurements

Students, collegues, headmaster and even television !


sport franco

The student in charge of the instruments is waiting patiently as well as the vehicule which is going to collect the data.


cnes


Temperature inside the « box »
Temperature of the « box » side
Outside temperature
Light
13h52

Microsoft Excel - Données ballon.xls

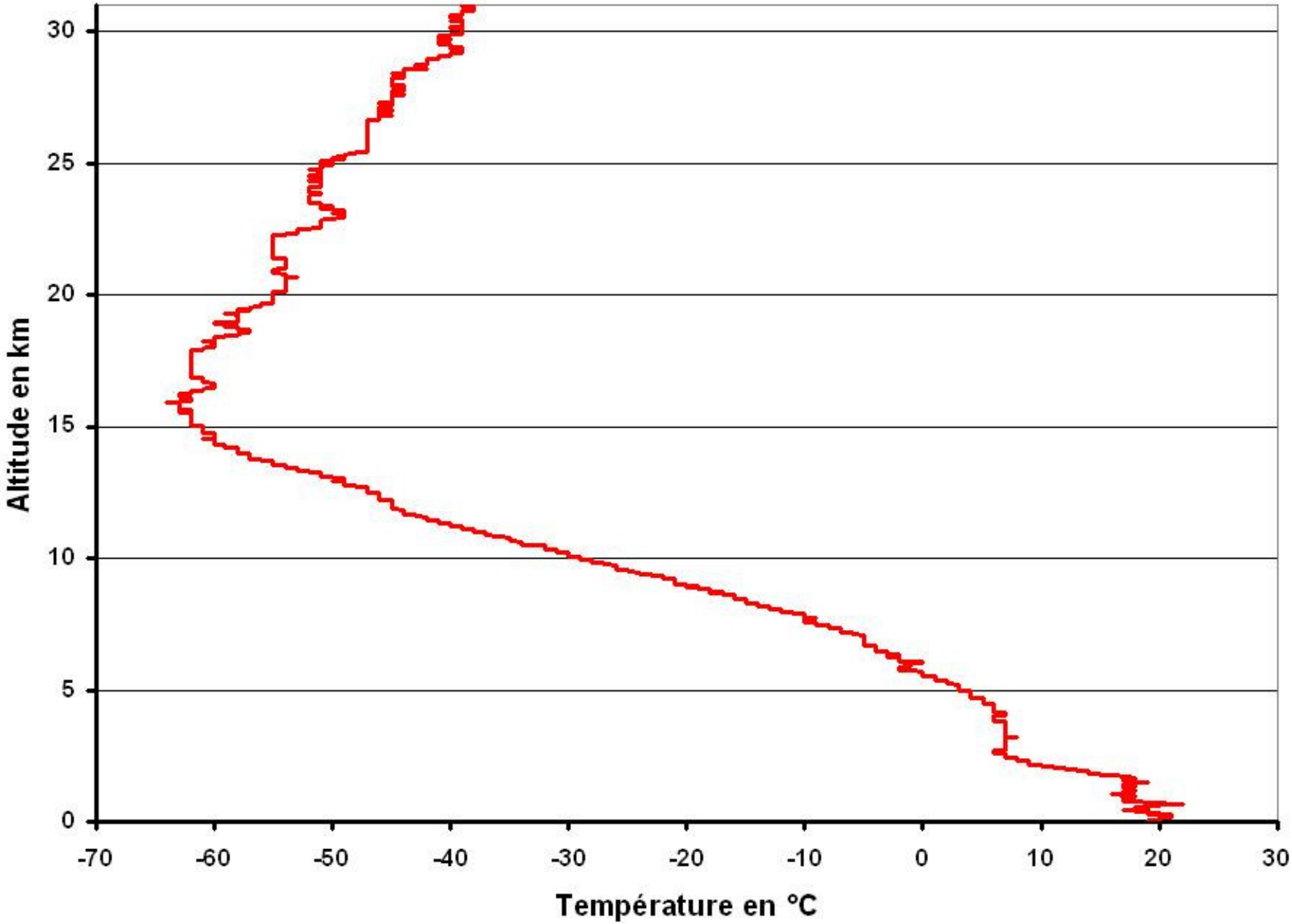
Fichier Edition Affichage Insertion Format Outils Données Fenêtre ? Acrobat

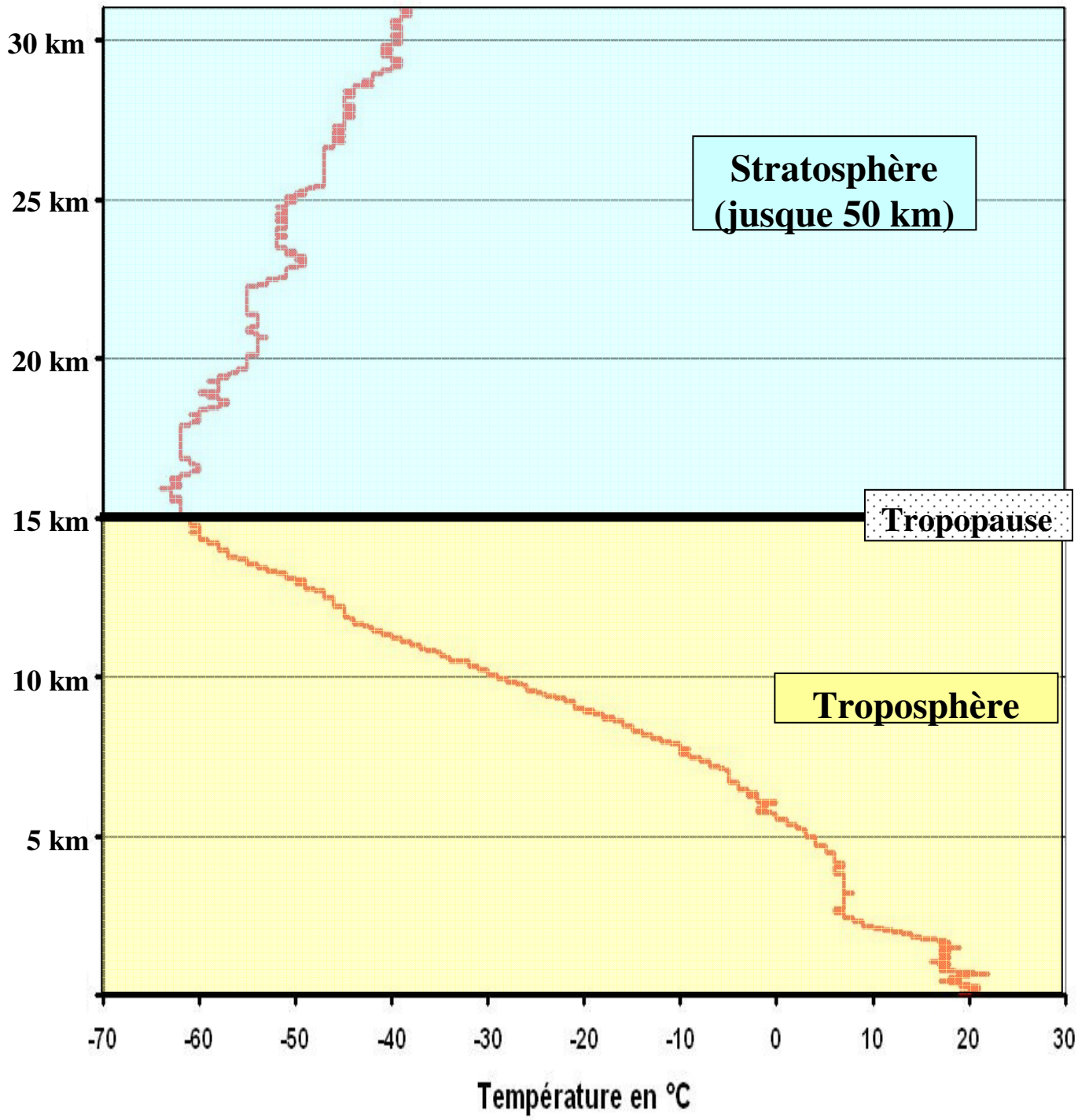
Arial 10

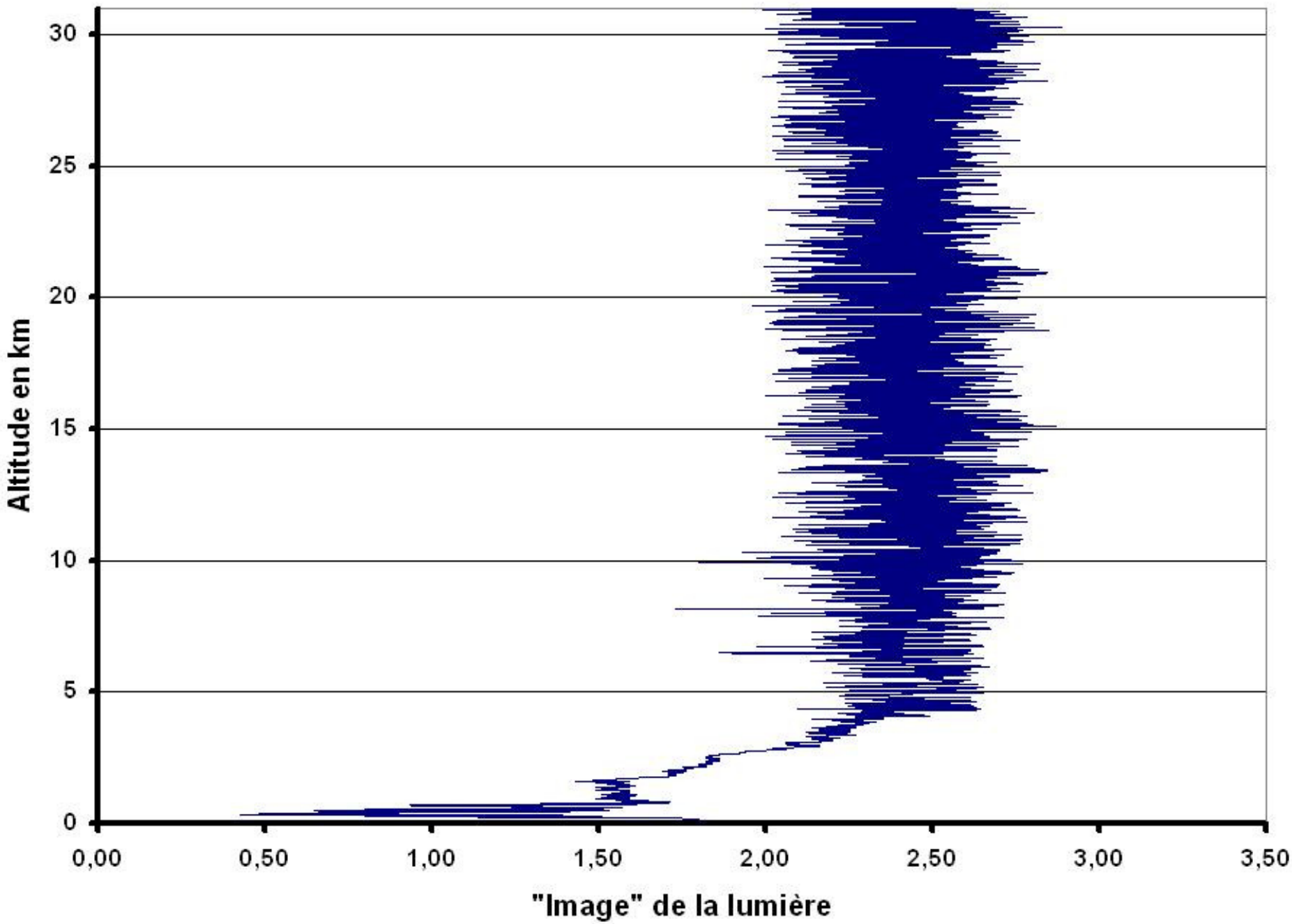
H3 = =0,27*(C3/60)

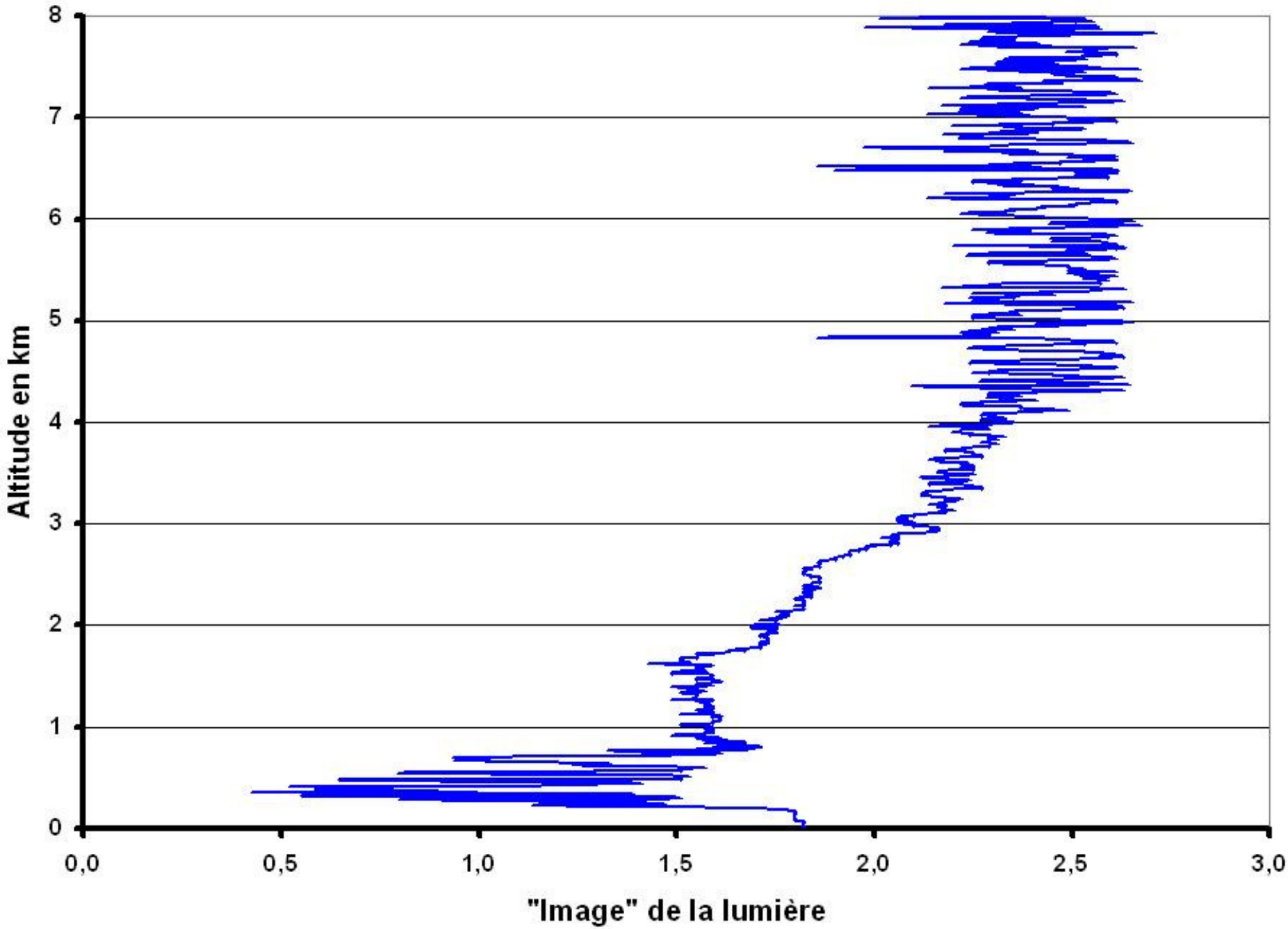
	A	B	C	D	E	F	G	H	I	J	K
1			temps en s	t° en V	t° en V	t° en V	t° extérieure en °C	altitude en km	lumière en V	tension en V	
2	Date	Heure		tempInt	tempNacel	tempExt			lumHaut	Piles	
3	30/09/2005	13:32:53	0	4,37	4,37	4,39	20	0	1,82	8,78	
4	30/09/2005	13:32:55	2	4,37	4,37	4,39	20	0,009	1,82	8,78	
5	30/09/2005	13:32:57	4	4,37	4,37	4,37	19	0,018	1,82	8,78	
6	30/09/2005	13:32:58	6	4,37	4,37	4,37	19	0,027	1,82	8,78	
7	30/09/2005	13:33:00	8	4,37	4,37	4,39	20	0,036	1,82	8,78	
8	30/09/2005	13:33:02	10	4,37	4,37	4,39	20	0,045	1,82	8,78	
9	30/09/2005	13:33:05	12	4,37	4,37	4,39	20	0,054	1,82	8,78	
10	30/09/2005	13:33:08	14	4,37	4,37	4,39	20	0,063	1,82	8,78	
11	30/09/2005	13:33:10	16	4,37	4,37	4,39	20	0,072	1,82	8,78	
12	30/09/2005	13:33:13	18	4,37	4,37	4,39	20	0,081	1,8	8,78	
13	30/09/2005	13:33:15	20	4,37	4,37	4,39	20	0,09	1,8	8,78	
14	30/09/2005	13:33:17	22	4,37	4,37	4,39	20	0,099	1,8	8,78	
15	30/09/2005	13:33:18	24	4,37	4,37	4,39	20	0,108	1,8	8,78	
16	30/09/2005	13:33:20	26	4,37	4,37	4,39	20	0,117	1,8	8,78	
17	30/09/2005	13:33:22	28	4,37	4,37	4,39	20	0,126	1,8	8,72	
18	30/09/2005	13:33:24	30	4,37	4,39	4,39	20	0,135	1,8	8,72	
19	30/09/2005	13:33:27	32	4,37	4,39	4,39	20	0,144	1,8	8,72	
20	30/09/2005	13:33:29	34	4,37	4,39	4,39	20	0,153	1,8	8,72	
21	30/09/2005	13:33:32	36	4,37	4,39	4,39	20	0,162	1,8	8,72	
22	30/09/2005	13:33:33	38	4,37	4,39	4,39	20	0,171	1,8	8,72	
23	30/09/2005	13:33:35	40	4,37	4,39	4,41	21	0,18	1,78	8,72	
24	30/09/2005	13:33:37	42	4,37	4,39	4,41	21	0,189	1,78	8,72	
25	30/09/2005	13:33:39	44	4,37	4,39	4,41	21	0,198	1,69	8,72	
26	30/09/2005	13:33:40	46	4,37	4,39	4,41	21	0,207	1,55	8,72	
27	30/09/2005	13:33:42	48	4,37	4,39	4,41	21	0,216	1,31	8,84	
28	30/09/2005	13:33:44	50	4,37	4,39	4,41	21	0,225	1,16	8,84	
29	30/09/2005	13:33:45	52	4,37	4,39	4,43	21	0,234	1,14	8,78	
30	30/09/2005	13:33:47	54	4,37	4,39	4,41	21	0,243	1,47	8,78	
31	30/09/2005	13:33:49	56	4,37	4,39	4,41	21	0,252	1,24	8,84	
32	30/09/2005	13:33:51	58	4,37	4,39	4,41	21	0,261	1,16	8,78	
33	30/09/2005	13:33:54	60	4,37	4,39	4,41	21	0,27	1,41	8,84	
34	30/09/2005	13:33:55	62	4,37	4,39	4,41	21	0,279	0,8	8,84	
35	30/09/2005	13:33:57	64	4,37	4,39	4,39	20	0,288	1,43	8,84	
36	30/09/2005	13:33:59	66	4,37	4,39	4,37	19	0,297	1,51	8,84	

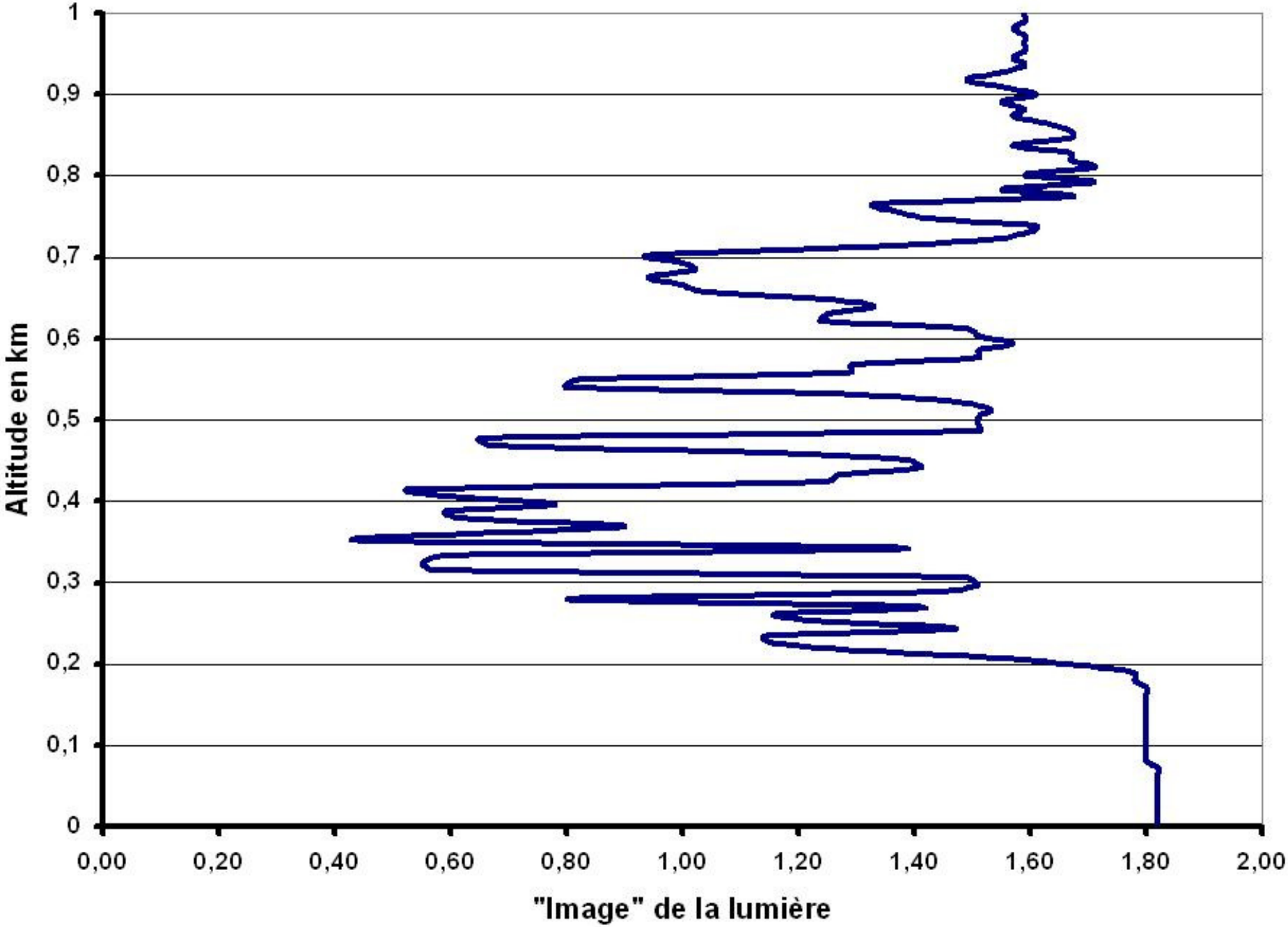
t° ext 31km | t° ext 8km | Graph5 | **Feuil1** | Température durée totale | Température 31


Altitude en km
30
25
20
15
10
5
0
-70
-60
-50
-40
-30
-20
-10
0
10
20
30
Température en °C


30 km
25 km
20 km
15 km
10 km
5 km
Stratosphère
(jusque 50 km)
Tropopause
Troposphère
-70
-60
-50
-40
-30
-20
-10
0
10
20
30
Température en °C

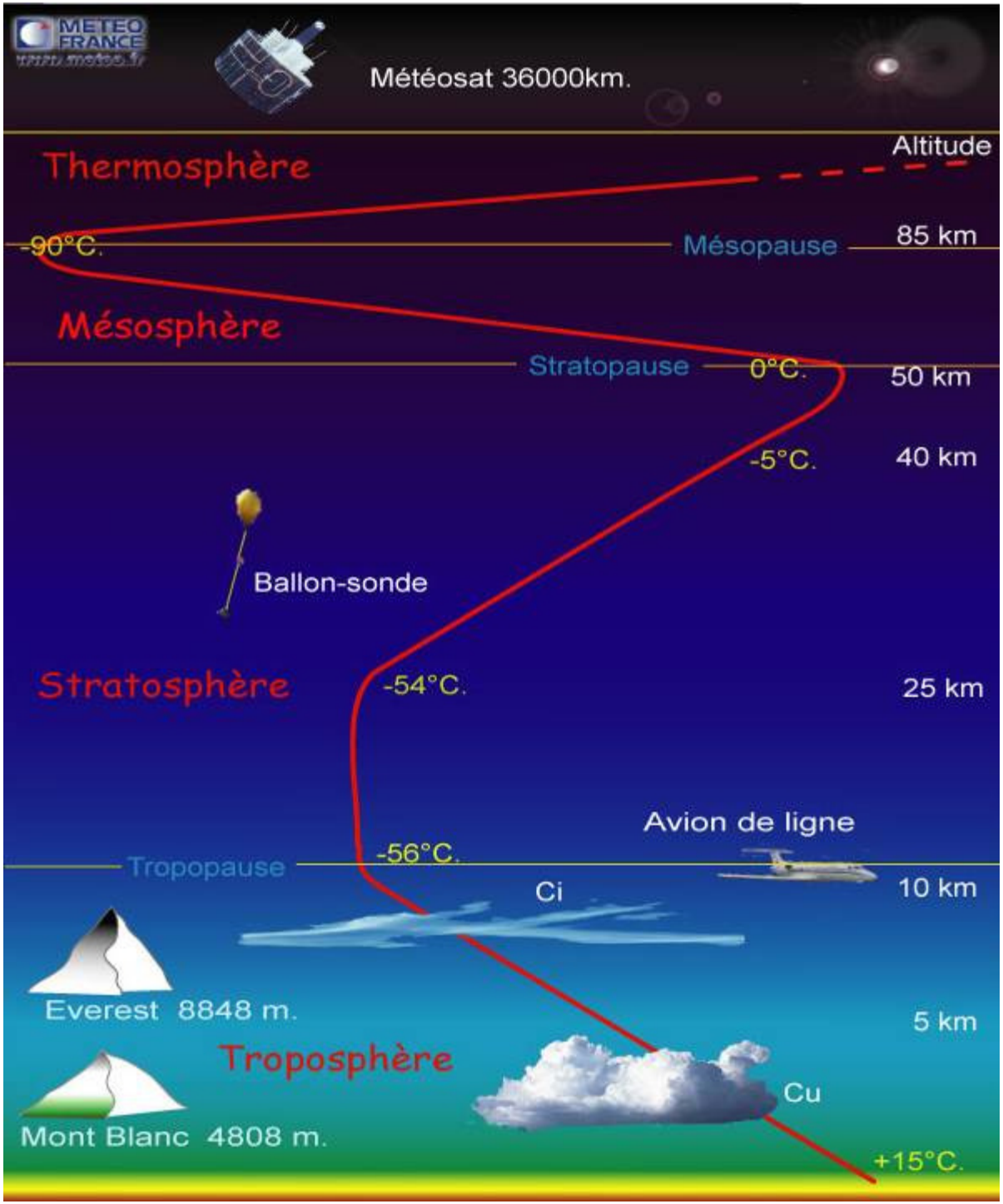

Altitude en km
30
25
20
15
10
5
0
0,00
0,50
1,00
1,50
2,00
2,50
3,00
3,50
"Image" de la lumière


Altitude en km
0
1
2
3
4
5
6
7
8
0,0
0,5
1,0
1,5
2,0
2,5
3,0
"Image" de la lumière


Altitude en km
1
0,9
0,8
0,7
0,6
0,5
0,4
0,3
0,2
0,1
0
0,00
0,20
0,40
0,60
0,80
1,00
1,20
1,40
1,60
1,80
2,00
"Image" de la lumière


13h37


13h41


METEO FRANCE
www.meteo.fr
Météosat 36000km.
Altitude
Thermosphère
-90°C.
Mésopause
85 km
Mésosphère
Stratopause
0°C.
50 km
-5°C.
40 km
Ballon-sonde
Stratosphère
-54°C.
25 km
Avion de ligne
-56°C.
Tropopause
Ci
10 km
Everest 8848 m.
5 km
Troposphère
Cu
Mont Blanc 4808 m.
+15°C.

ASTAR 2007

(Arctic Study of Tropospheric Aerosol, Clouds, and Radiation)

European Fleet for Airborne Research

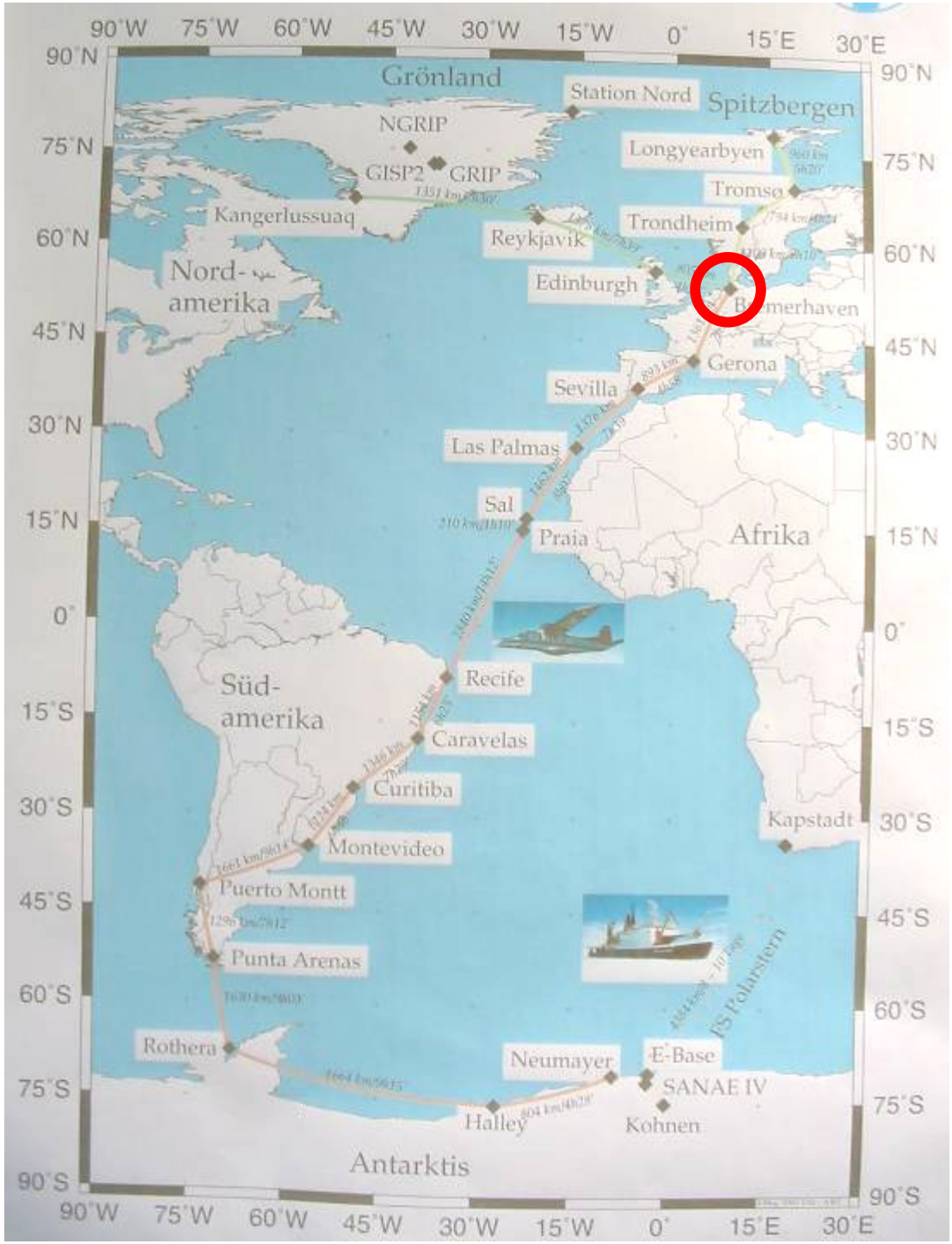
EUFAR aims at integrating the activities of the European fleet of instrumented aircraft in the field of environmental research in the atmospheric, marine, terrestrial and earth sciences.

Clémence and Pauline


I ANTARCTICA


POLAR 2

Polar 2 is owned by the Alfred Wegener Institute in Bremerhaven (north of Germany) and is regularly used for Arctic and Antarctic missions




OPTIMARE


D-CAWI


POLAR 2
SUMMIT
ANTARCTICA
HALLEY
75° 34' S 26° 23' W
ANTARCTICA
ARTIST
ANT XIX
2001/02

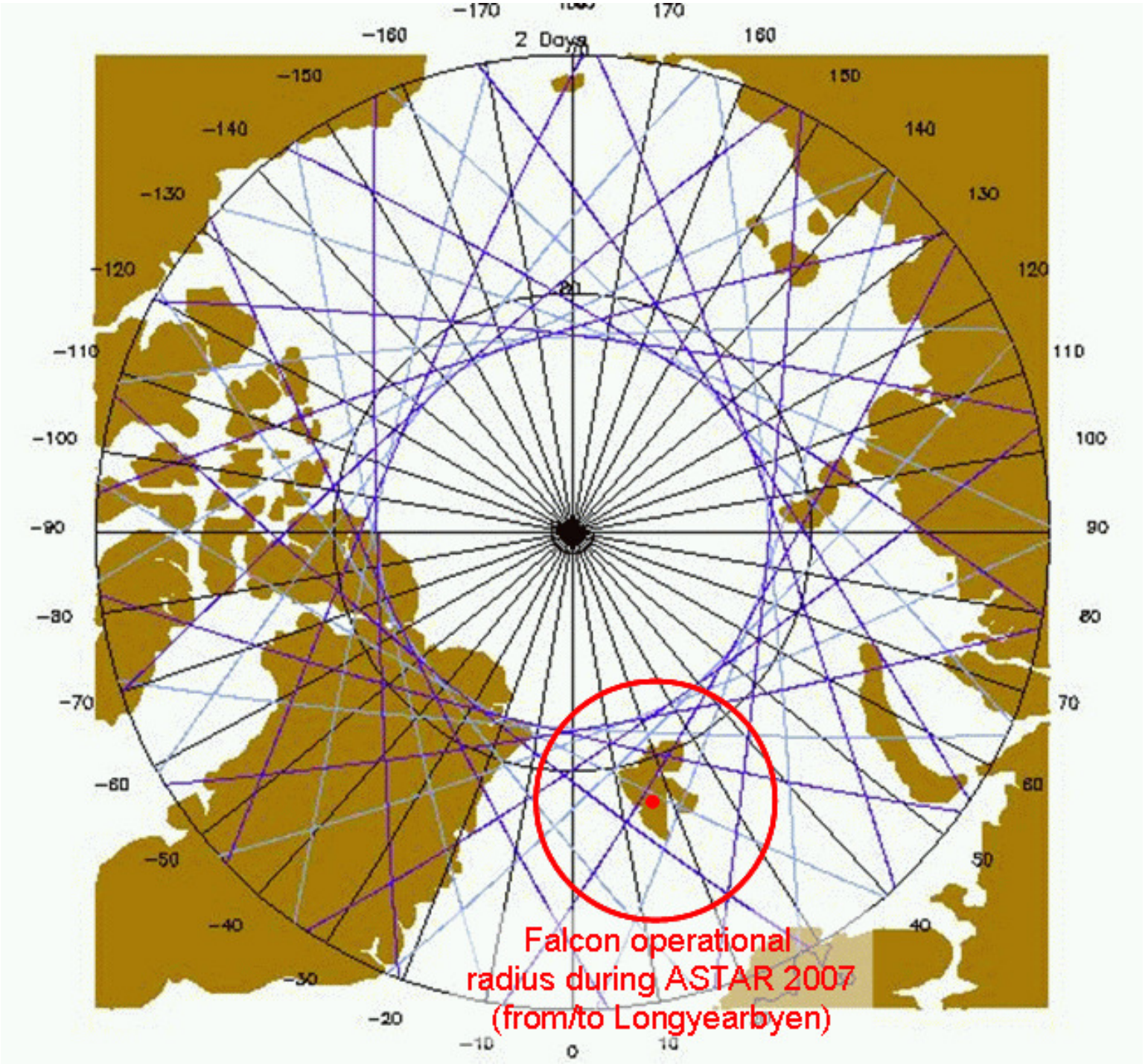
Cabin

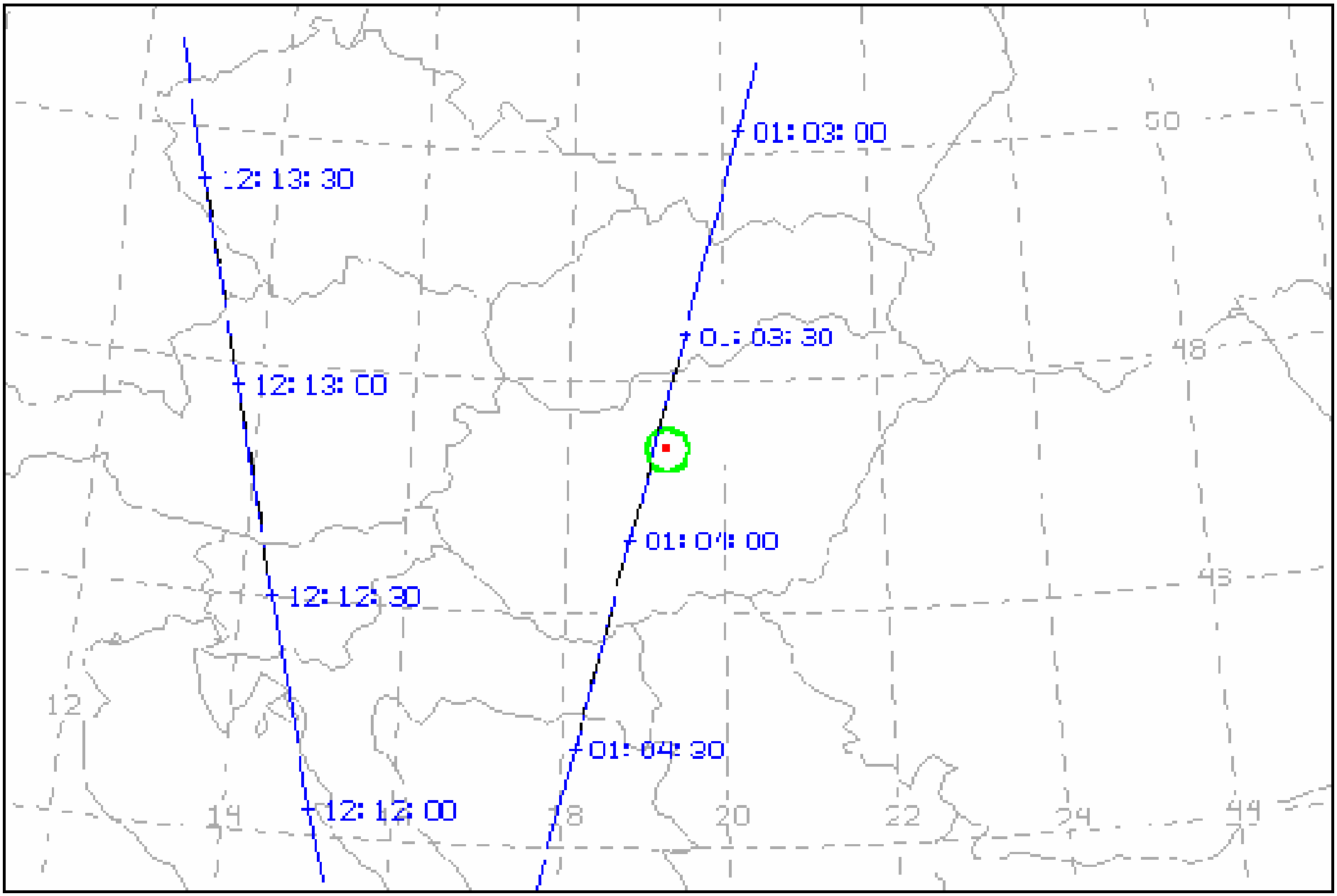
Length : 7,08 m
Width : 1,3 m
Height : 1,5 m

ASTAR 2007 will be in the vicinity of Svalbard (Norway) from Longyearbyen airport (78.25°N, 15.49°E).

The campaign in March / April 2007 during the Arctic Haze phase will be used to carried out validation measurements for the CALIPSO project

Because of the orbital characteristics of CALIPSO (polar orbit at an altitude of 705 km), there are 16 times more overpasses compared to mid-latitudes over the polar regions. This makes these regions important target areas for validation missions.


2 Days
Falcon operational
radius during ASTAR 2007
(from/to Longyearbyen)



Passage au-dessus de Budapest le 18 Mars 2007

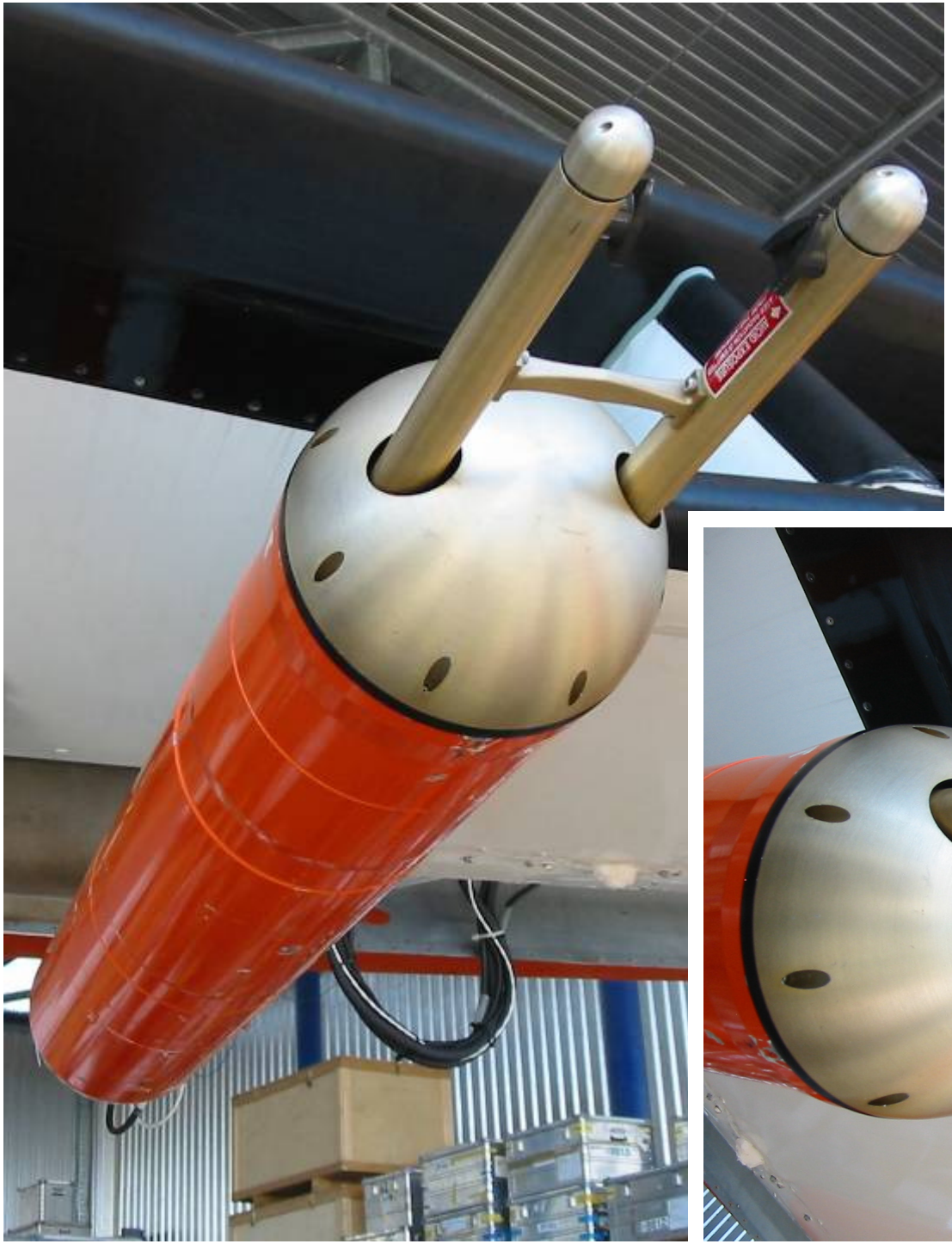
Measurements and Instruments

Cloud physical properties

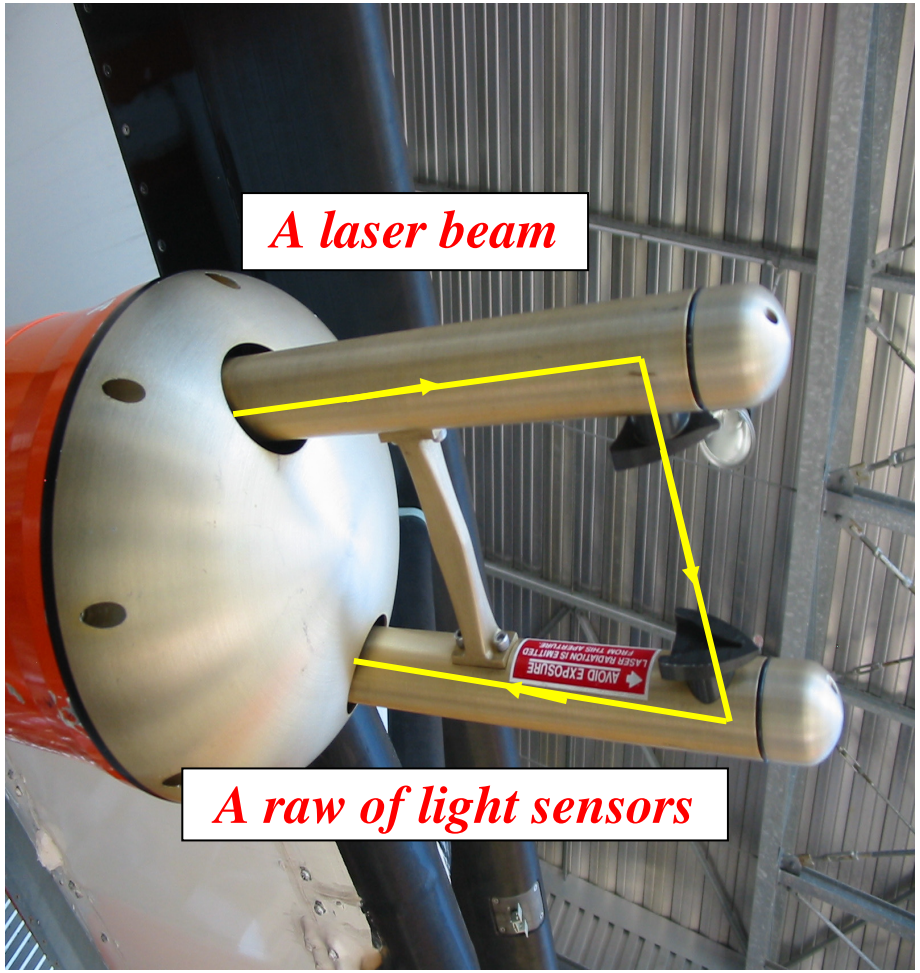
Particle morphology and size,

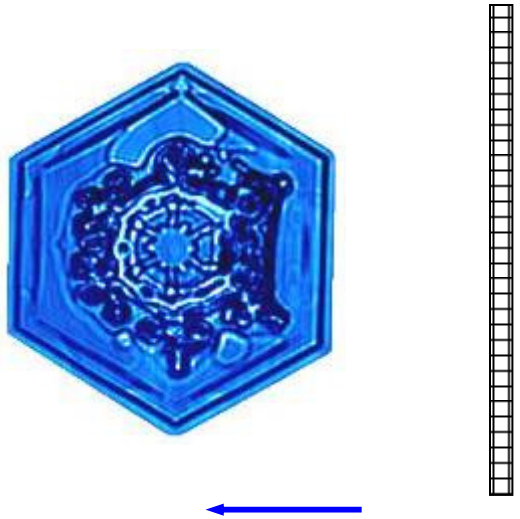
in-cloud partitioning of ice/water content


POLAR 2



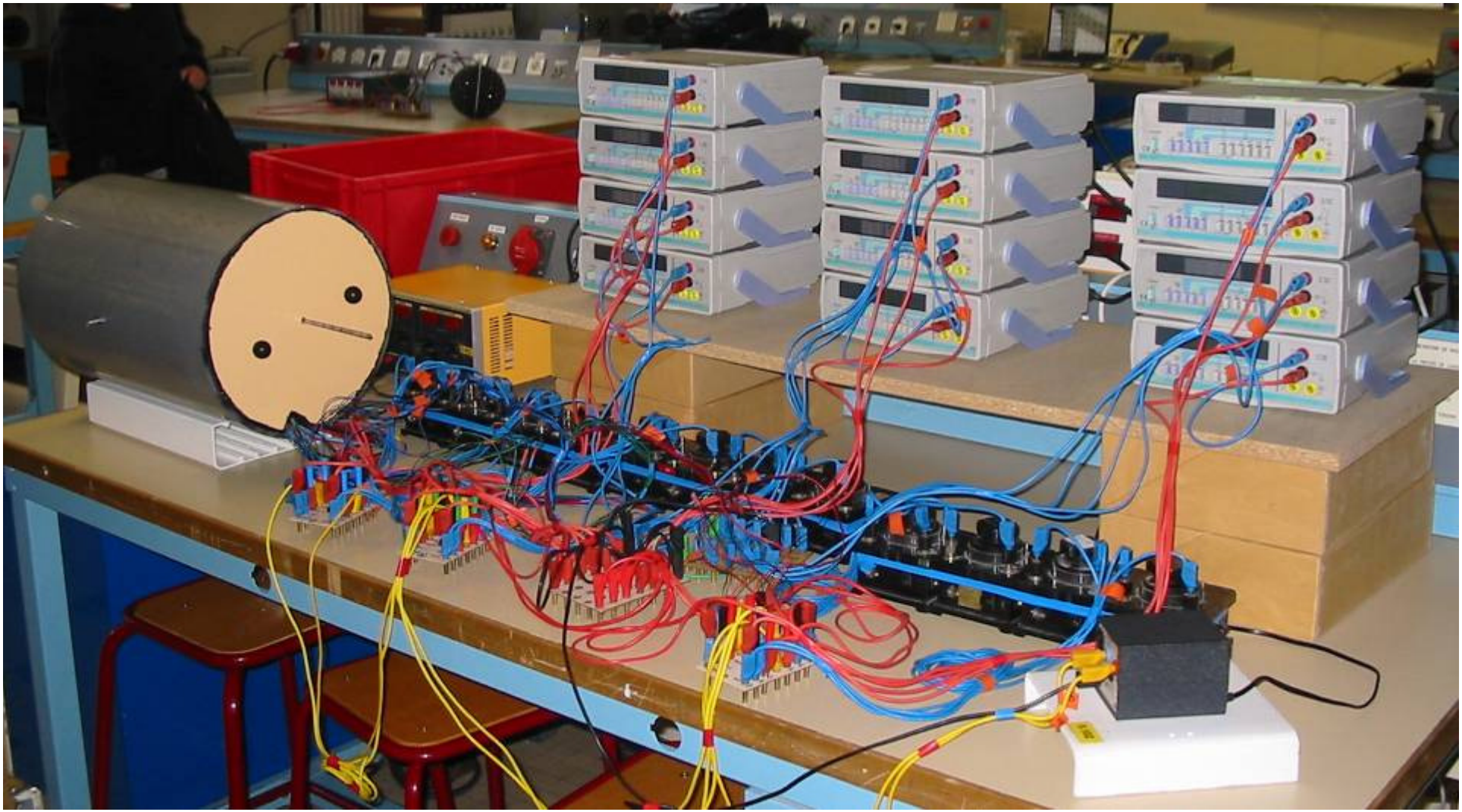

AVOID EXPOSURE
LASER RADIATION IS EMITTED
FROM THIS APERTURE

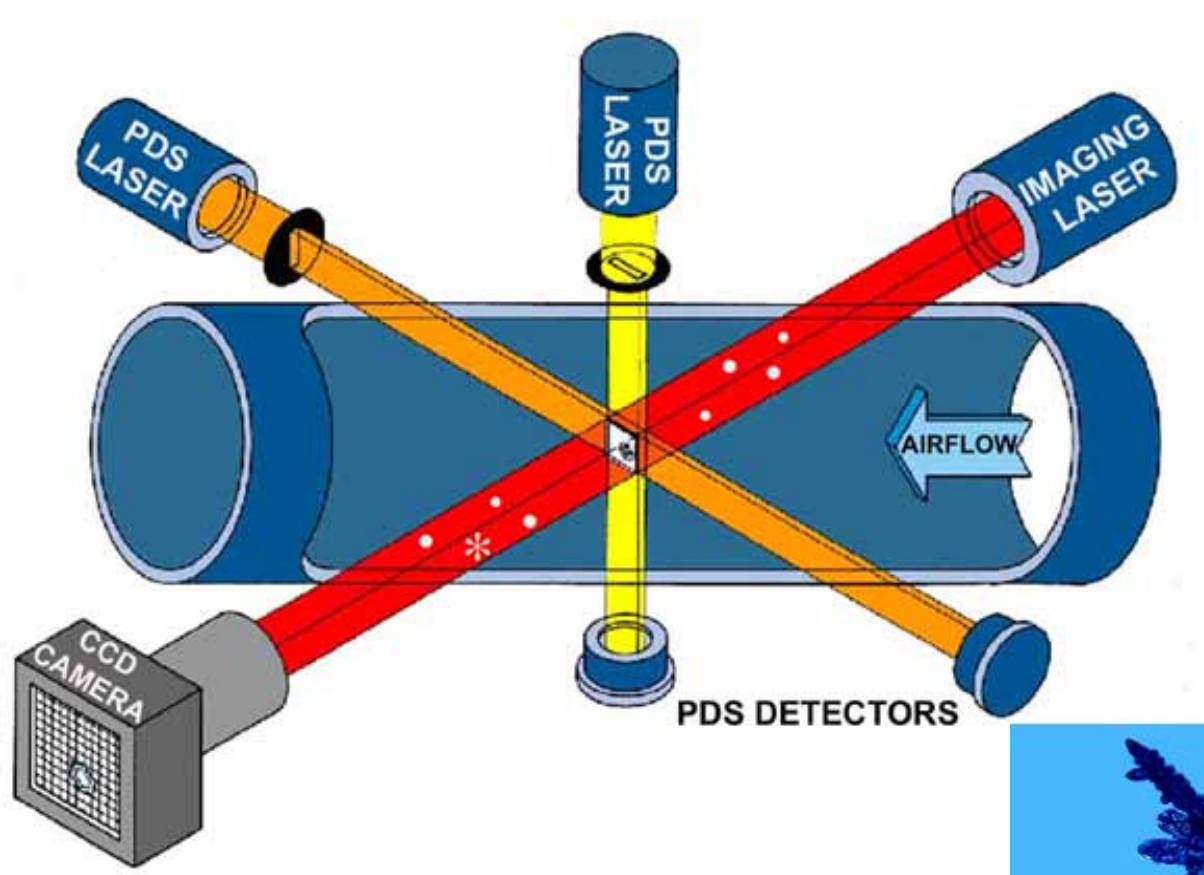


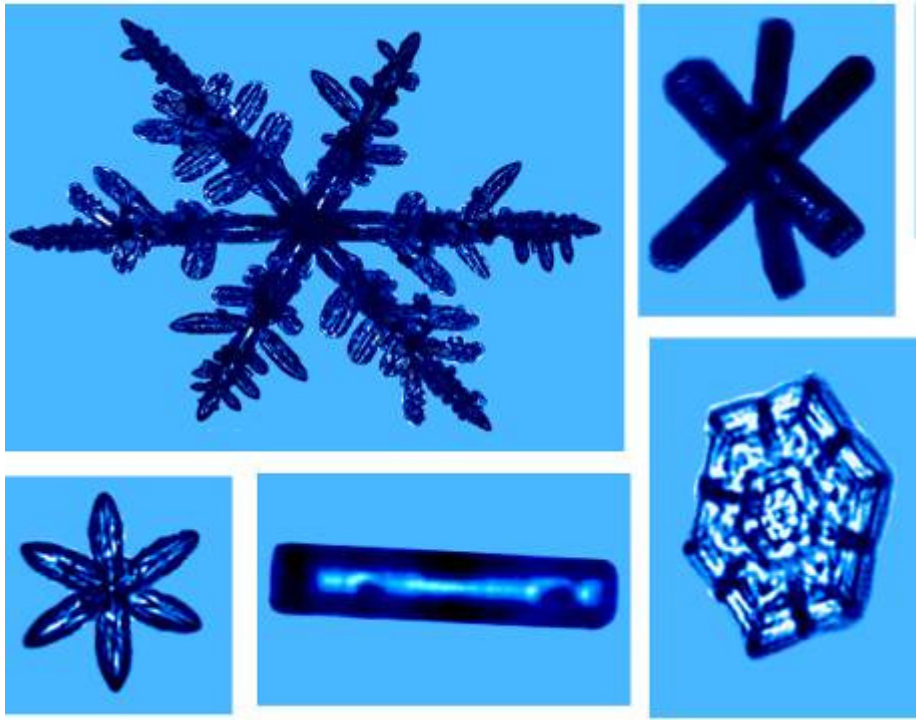


Déplacement relatif
« aérosol – rangée de capteurs embarqués »

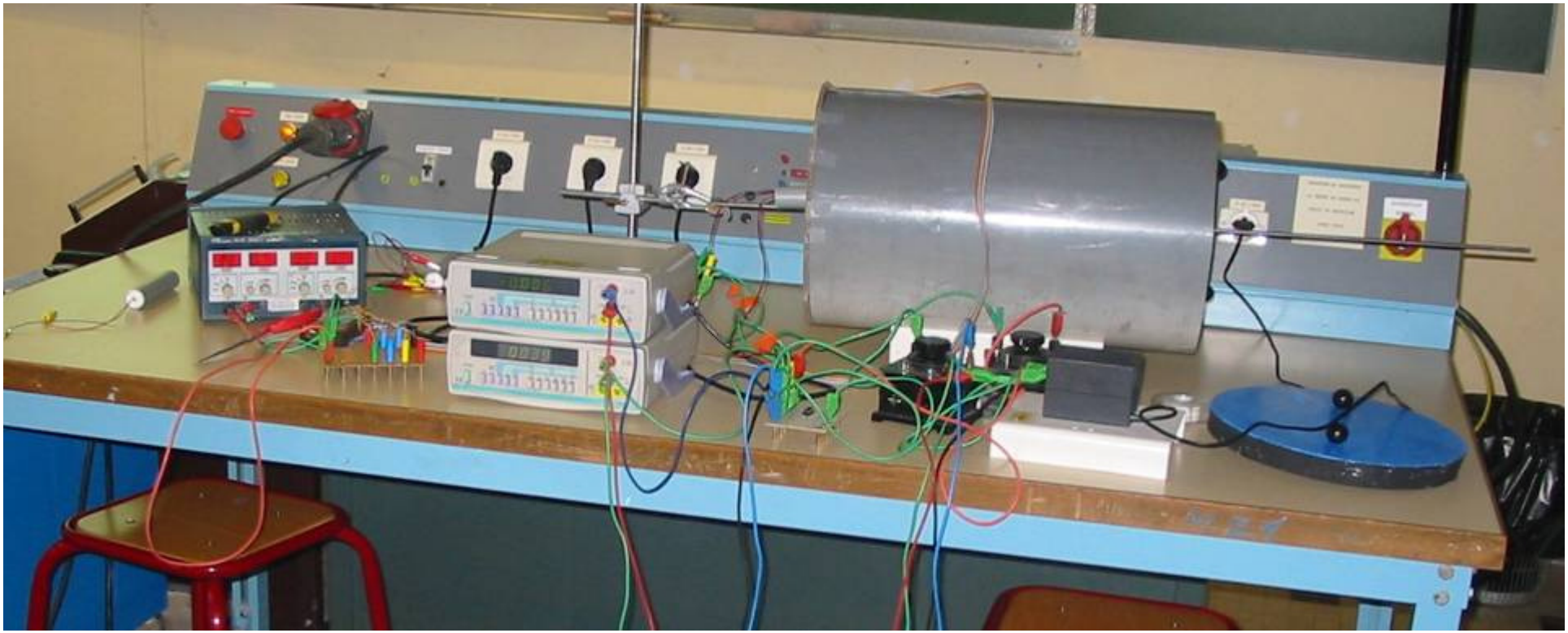
Resolution : 250 µm

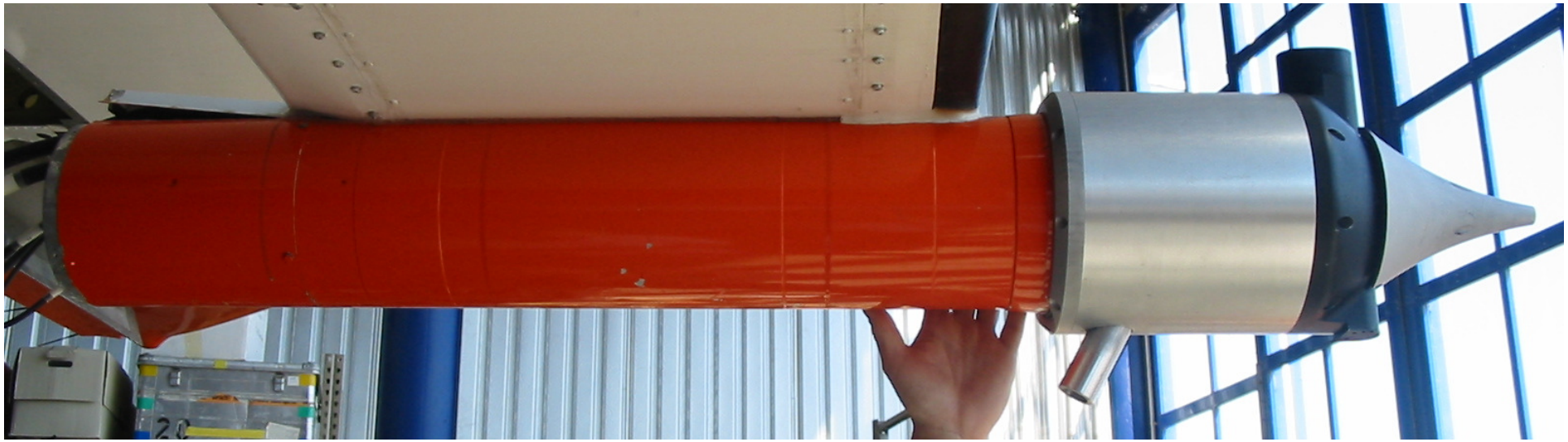


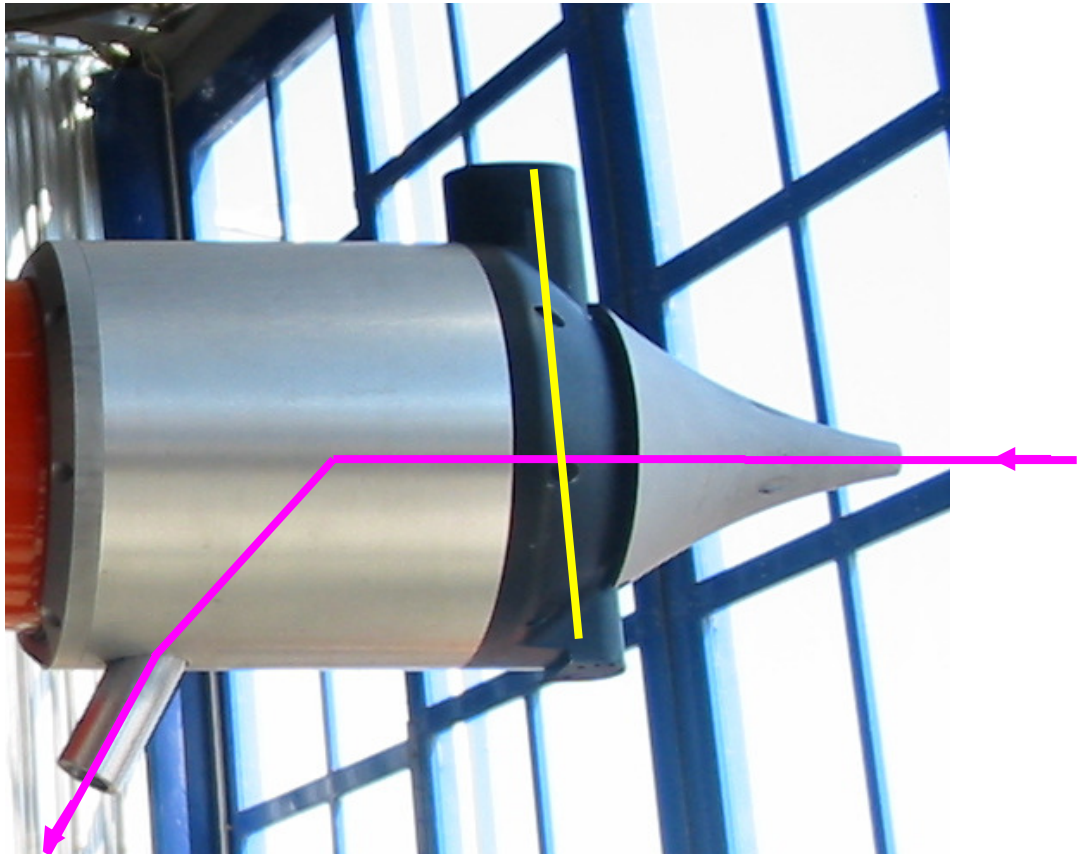




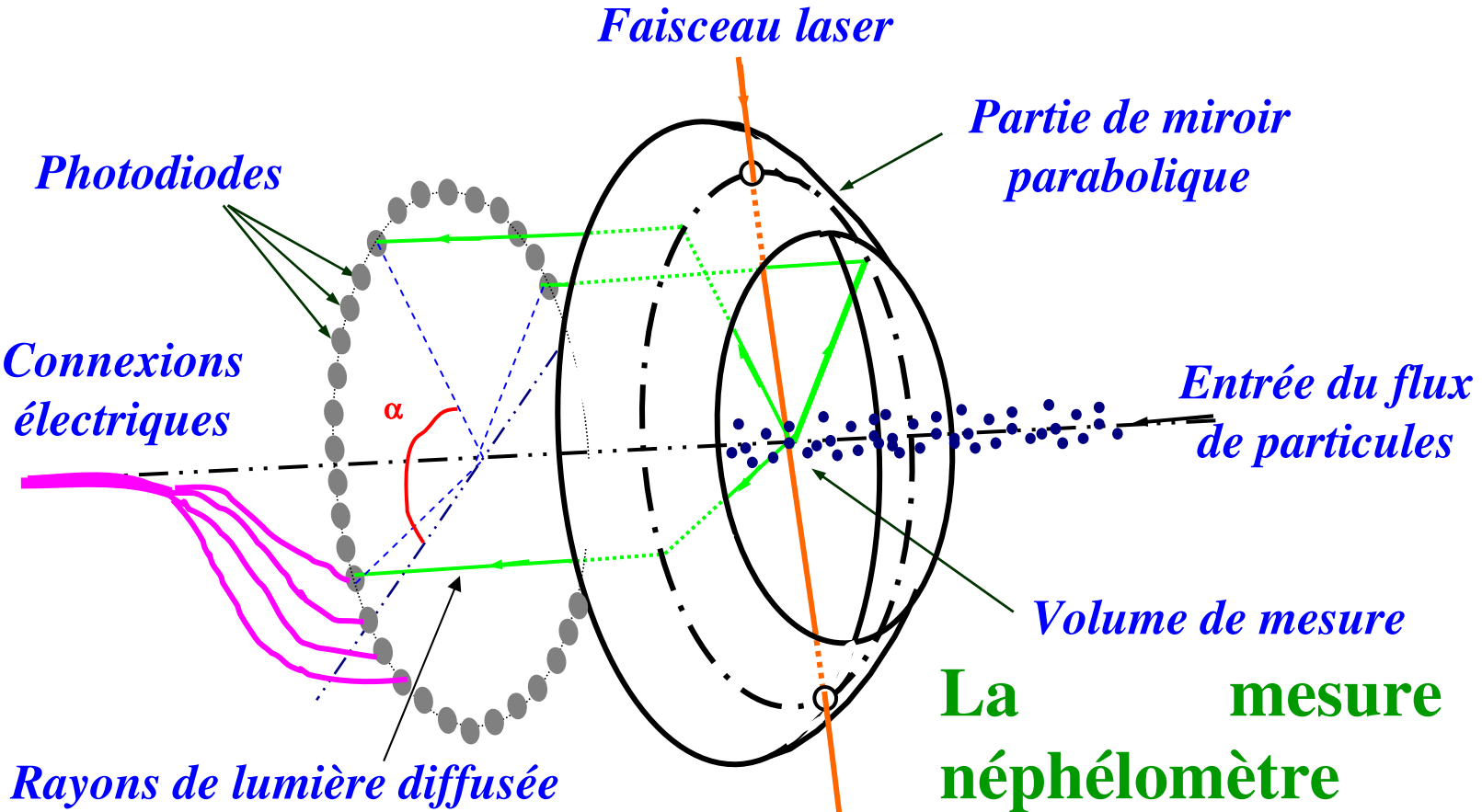
Resolution : 2,5 µm

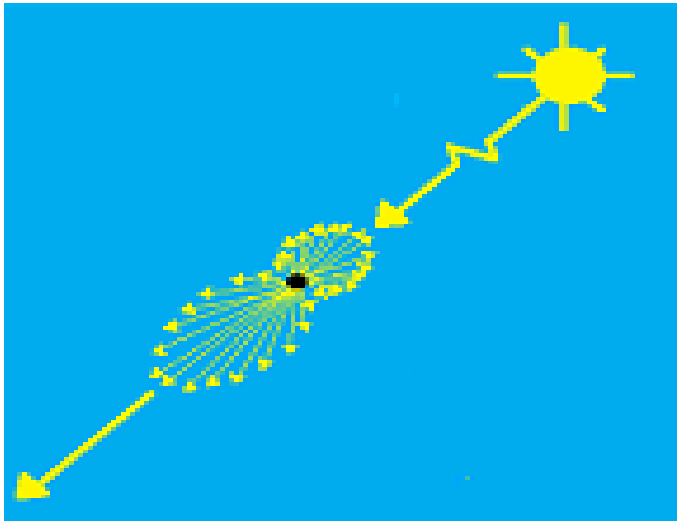




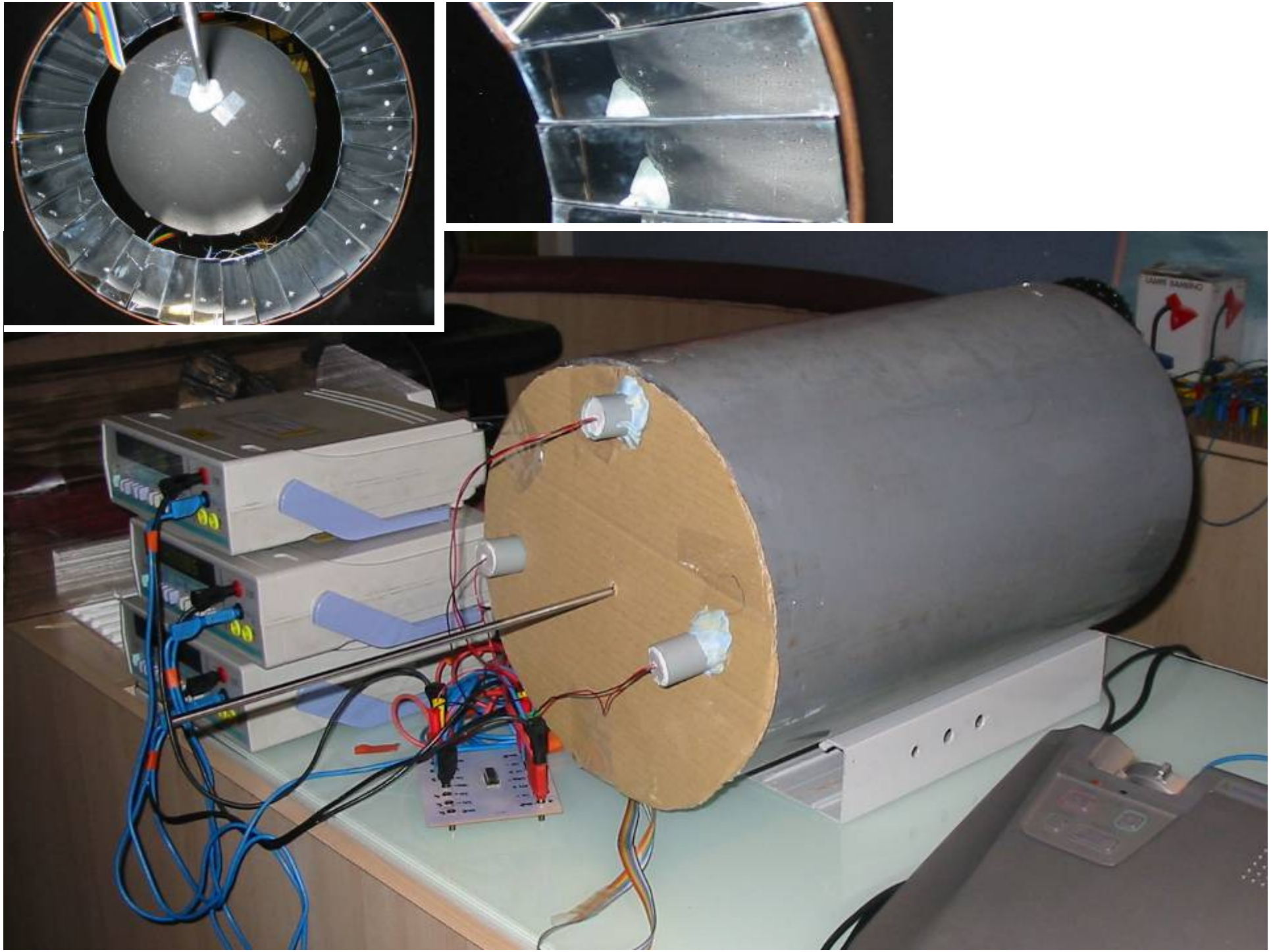


Water droplets or ice crystals or both?





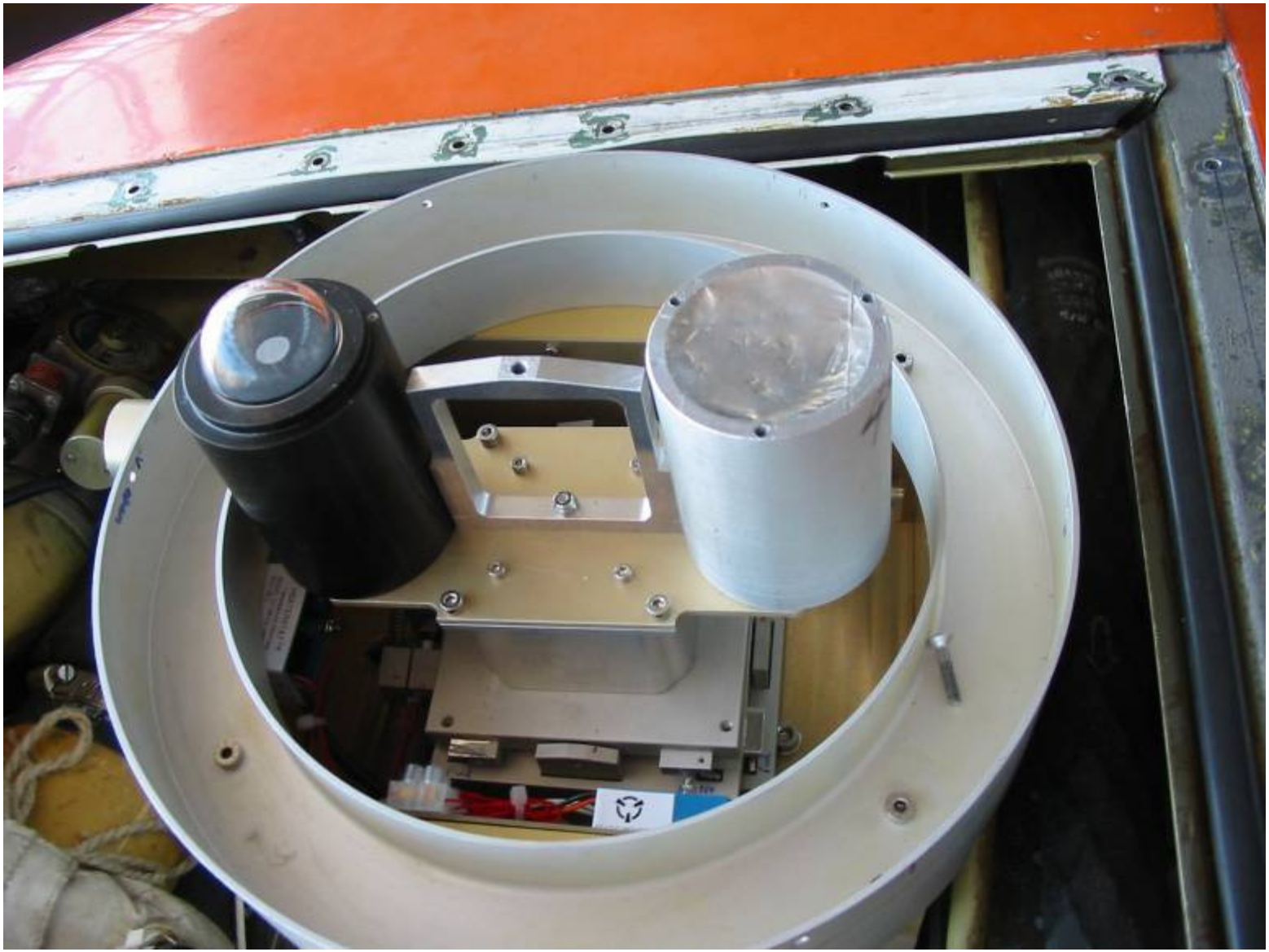
La mesure du néphélomètre polaire documente la fonction de phase de diffusion des particules nuageuses de dimensions comprises entre quelques microns et 800 µm de diamètre.



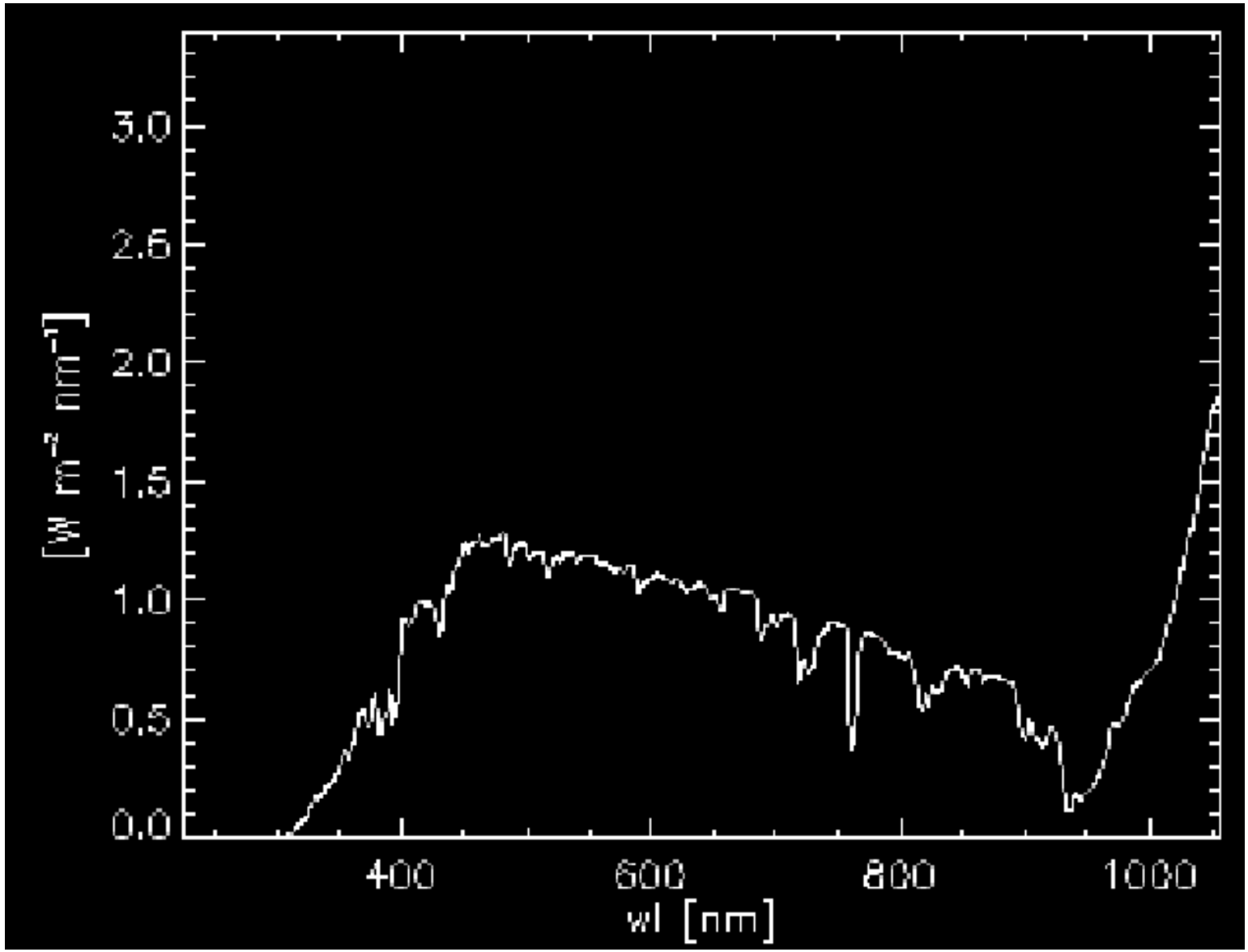
The albedometer

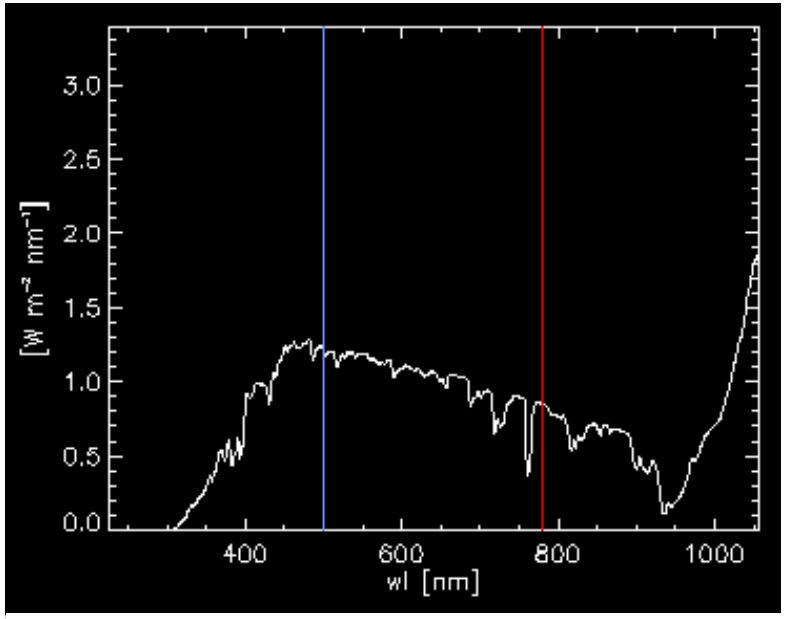
Twice the same instruments : one under the plane measuring light coming from the ground, the other on top of the plane measuring light coming from the Sun.

Two sensors on each instrument : the left one is measuring light from 300 to 1050 nm and the right one, light from 1000 to 3000 nm.



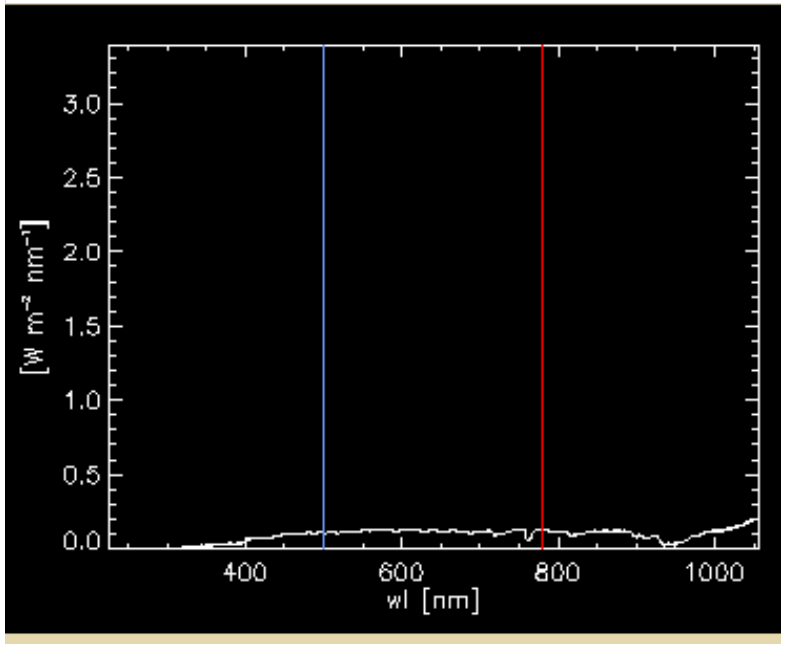
The light beams are splitted in smaller beams and sent on photodiodes : when a photodiode receives light, it creates a current that can be measured (the more light, the more intensity).

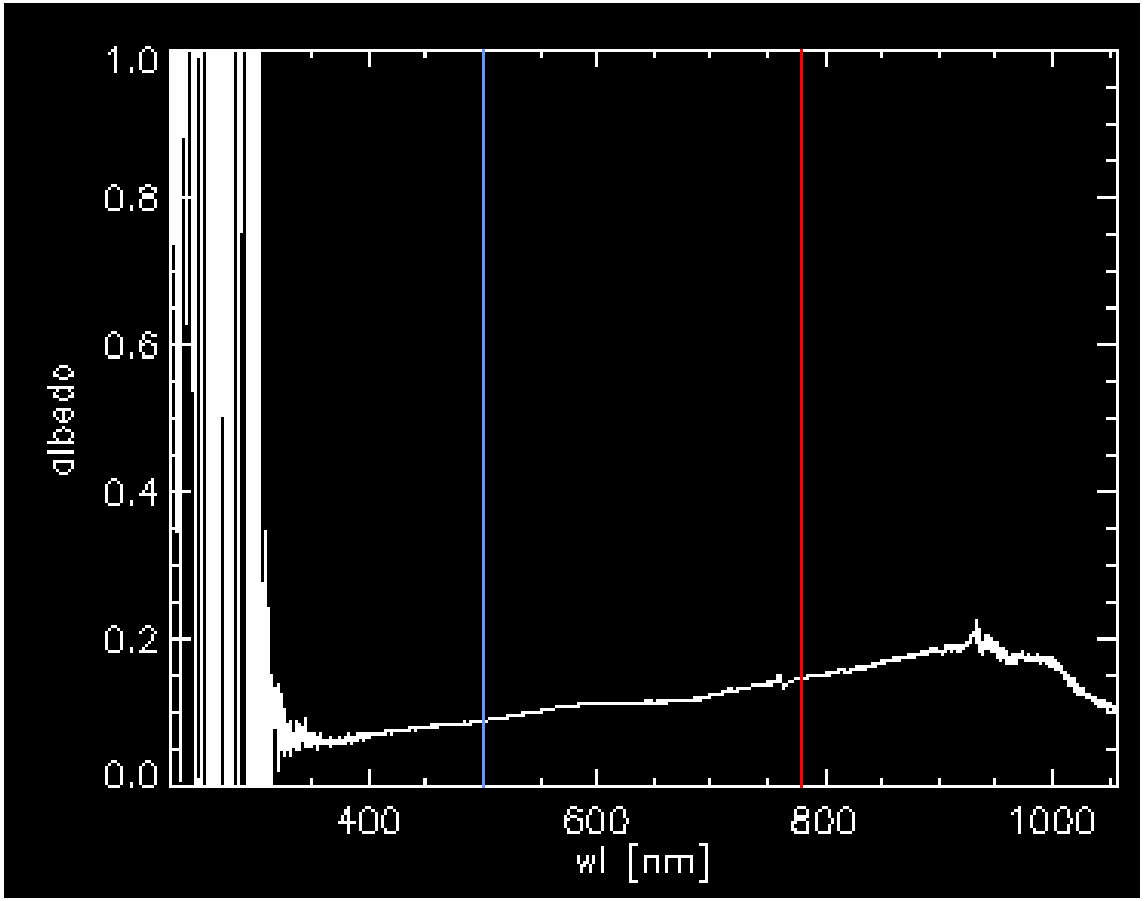


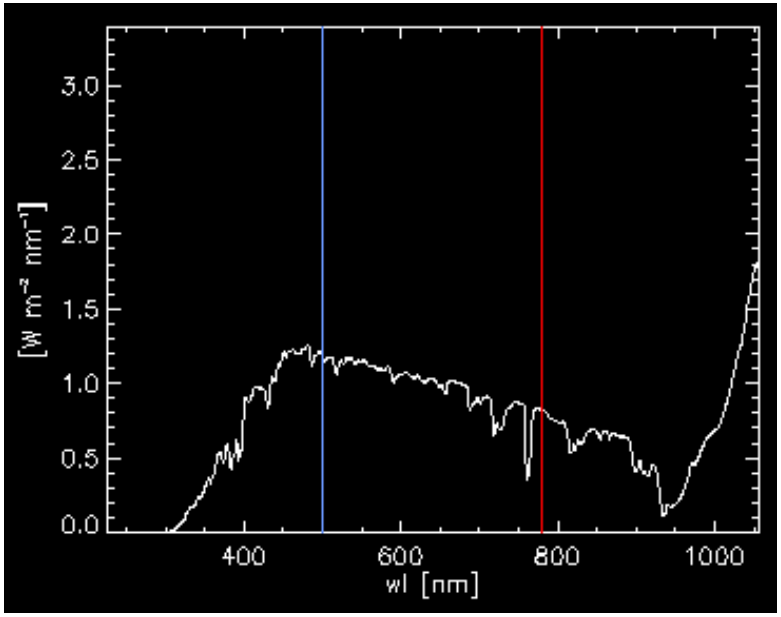


The albedo is the ratio between the 2 results.

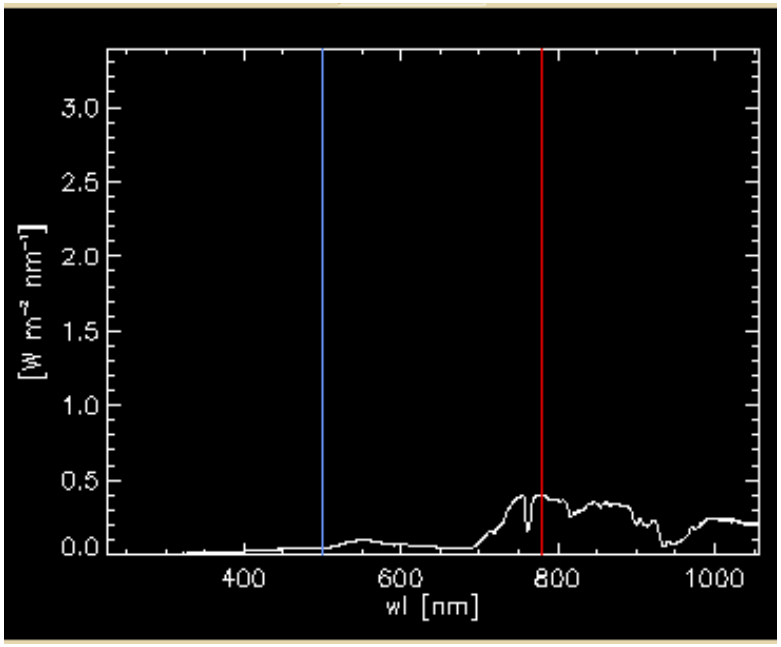
On that exemple, not much light is coming from the ground : the plane is still above the take off strip !

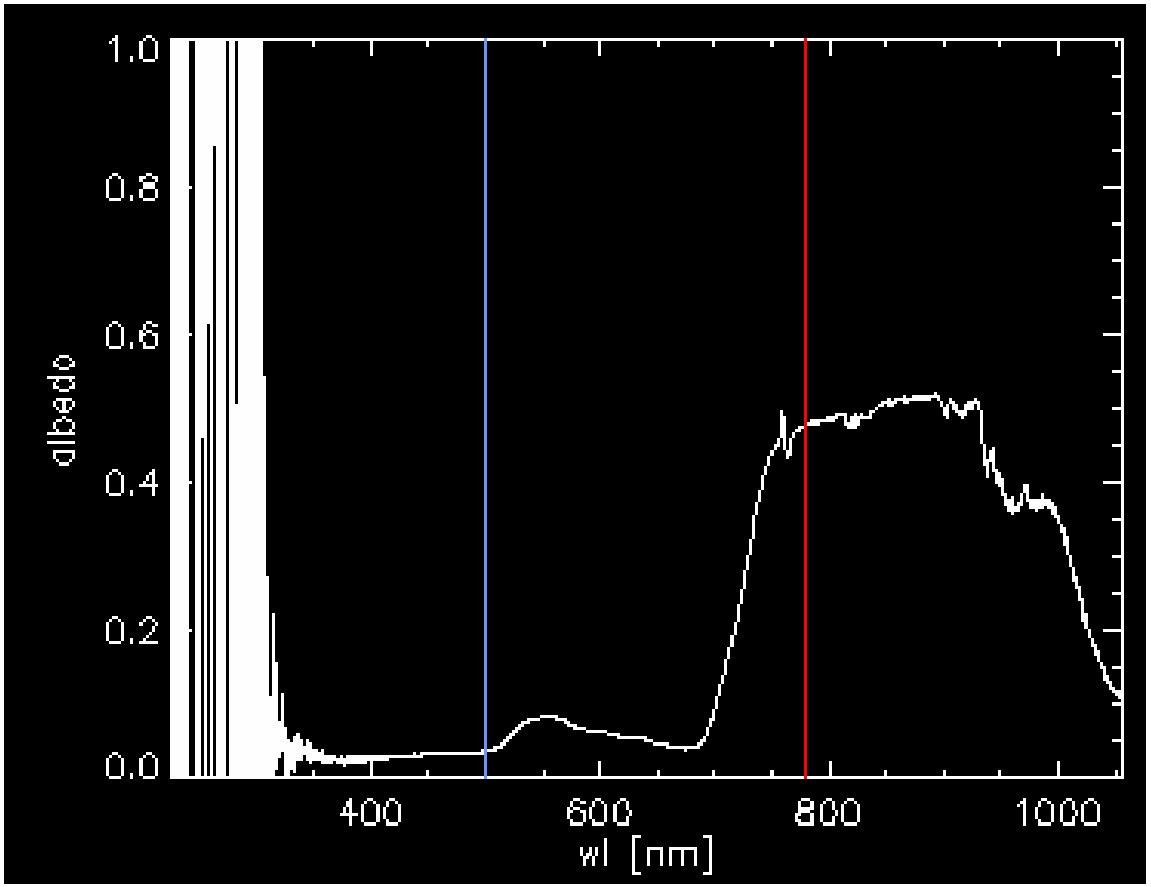






The albedo for a green meadow or a forest.

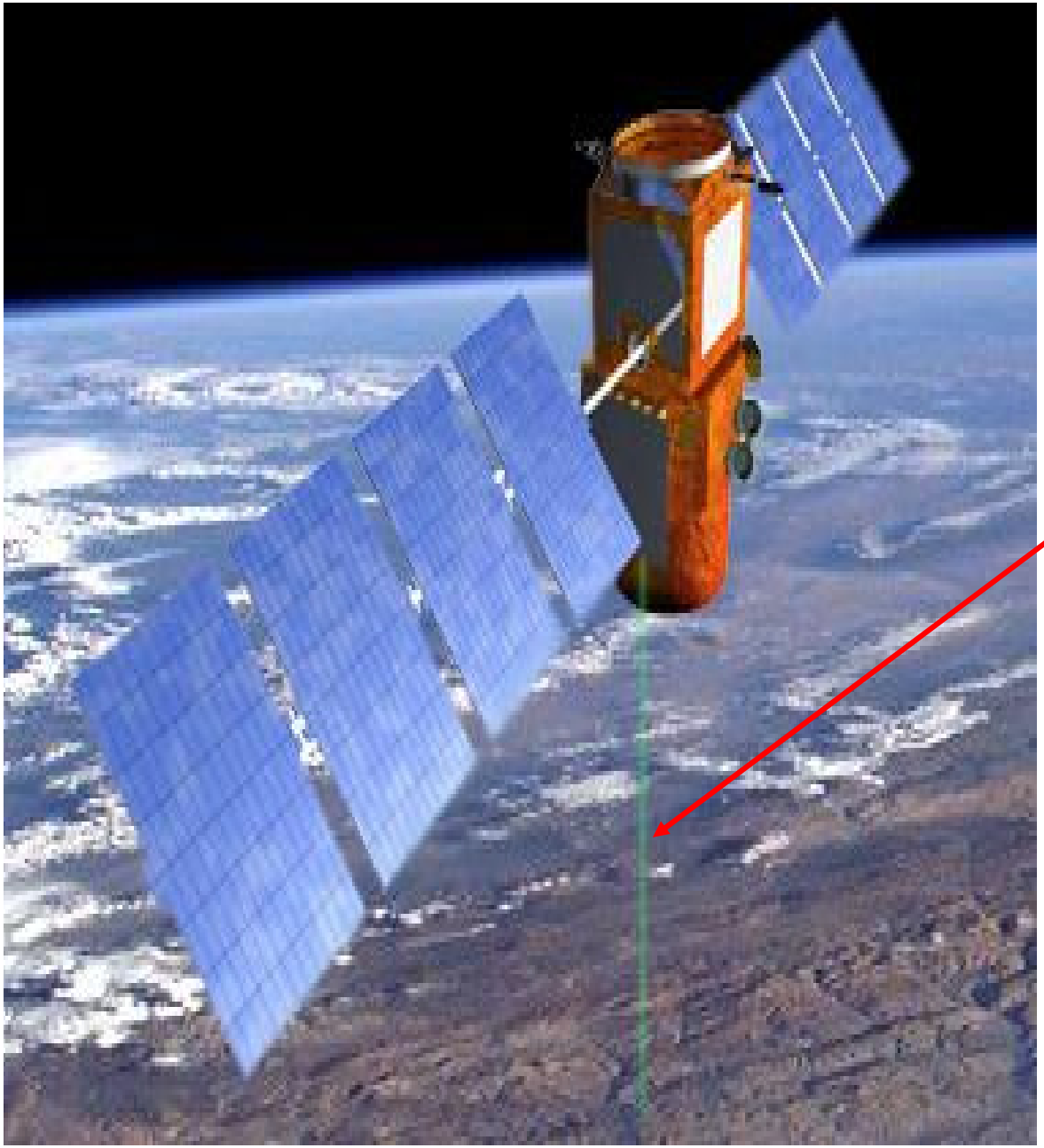




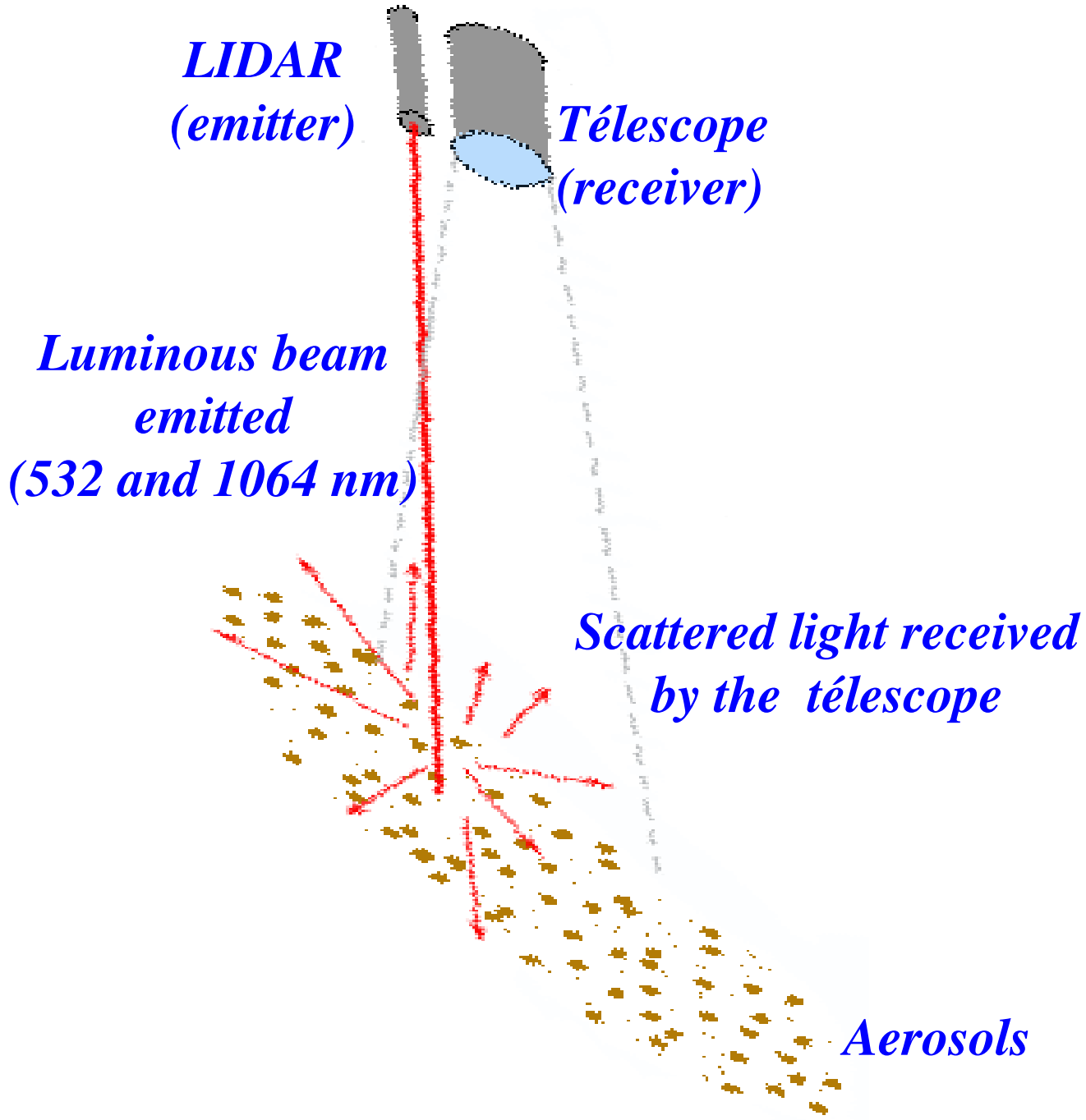
The axes of each sensor must be really vertical so the support of each instrument is maintened vertical by 3 servomotors correcting in real time the moves of the plane.

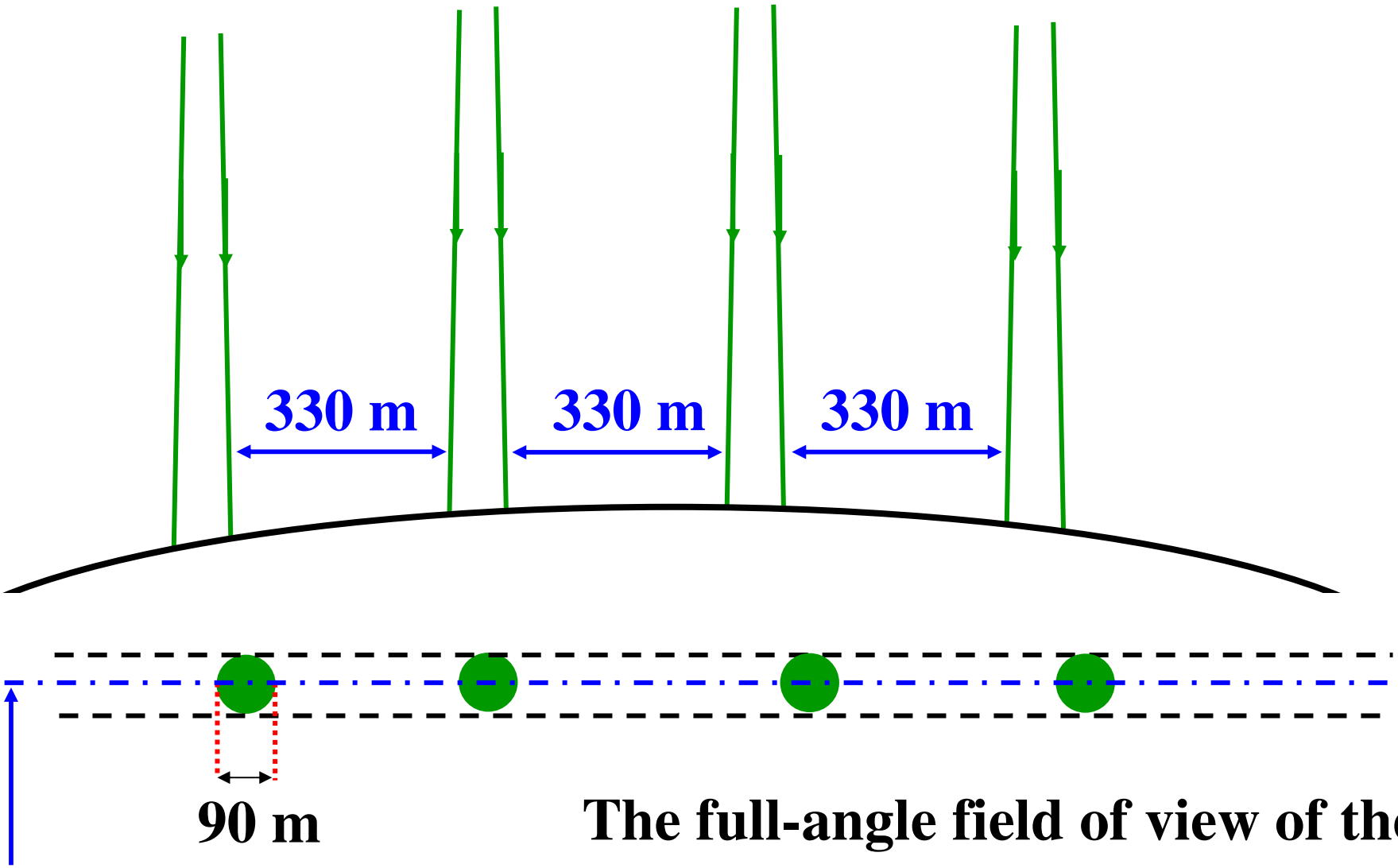

OPTIMARE
Sensorsysteme AG

The LIDAR

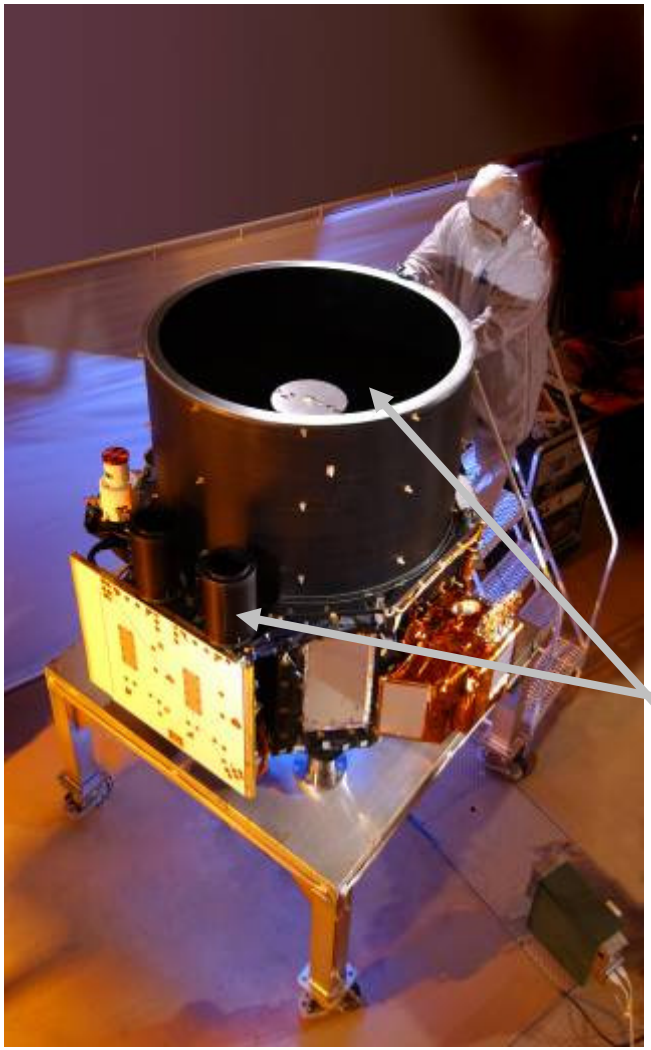


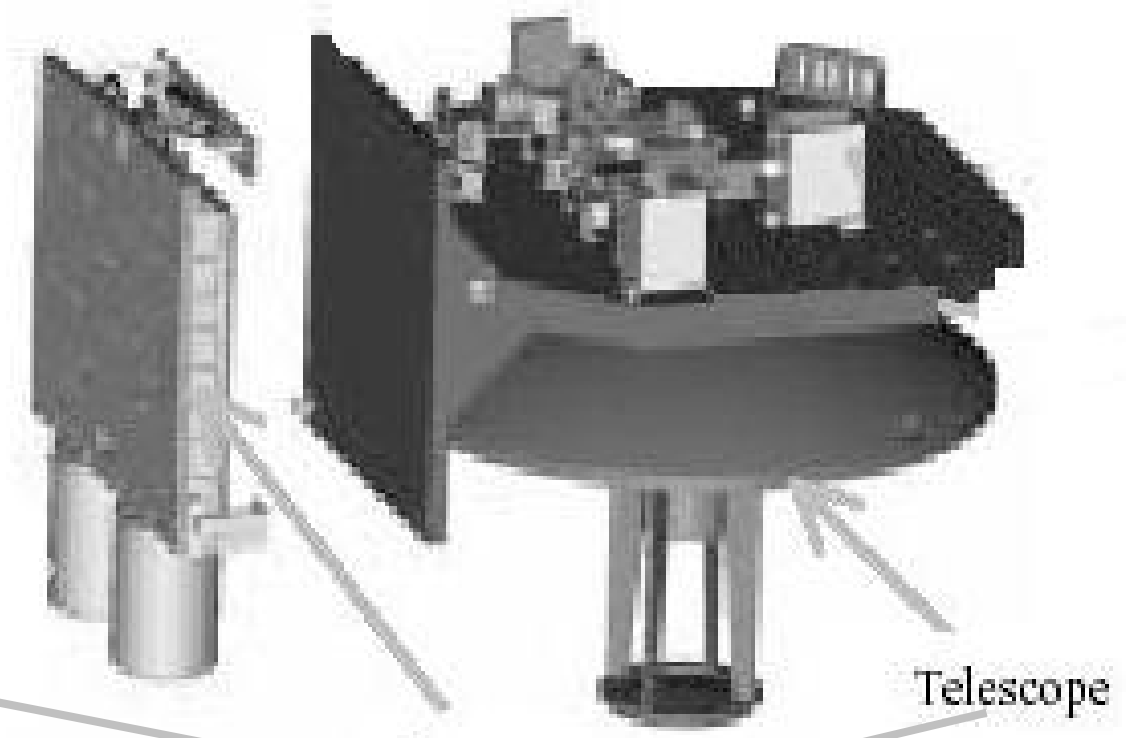
Calipso send light radiations in the ground direction. It is equipped with a LIDAR

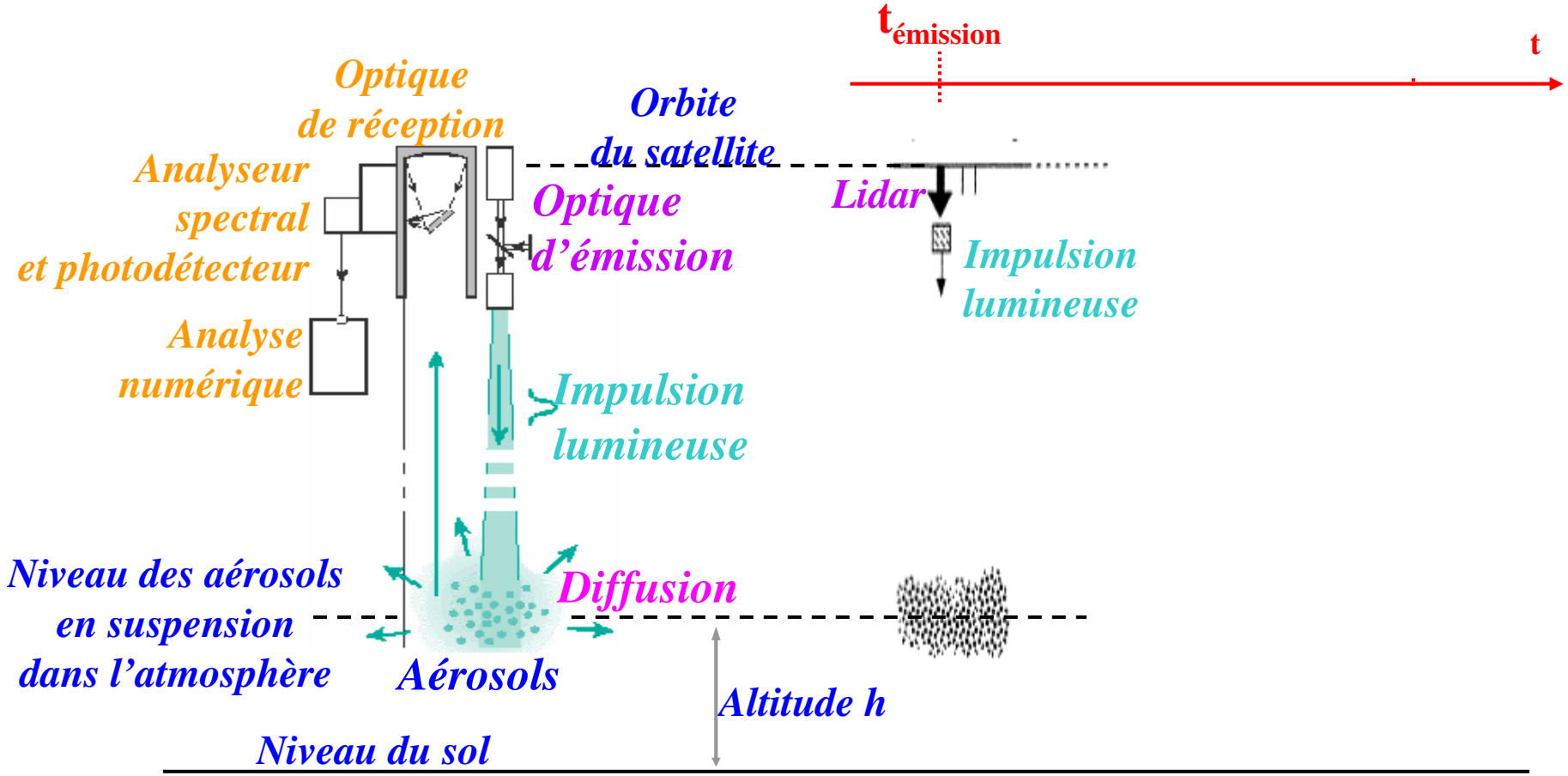

LIDAR
(emitter)
Télescope
(receiver)
Luminous beam
emitted
(532 and 1064 nm)
Scattered light received
by the télescope
Aerosols

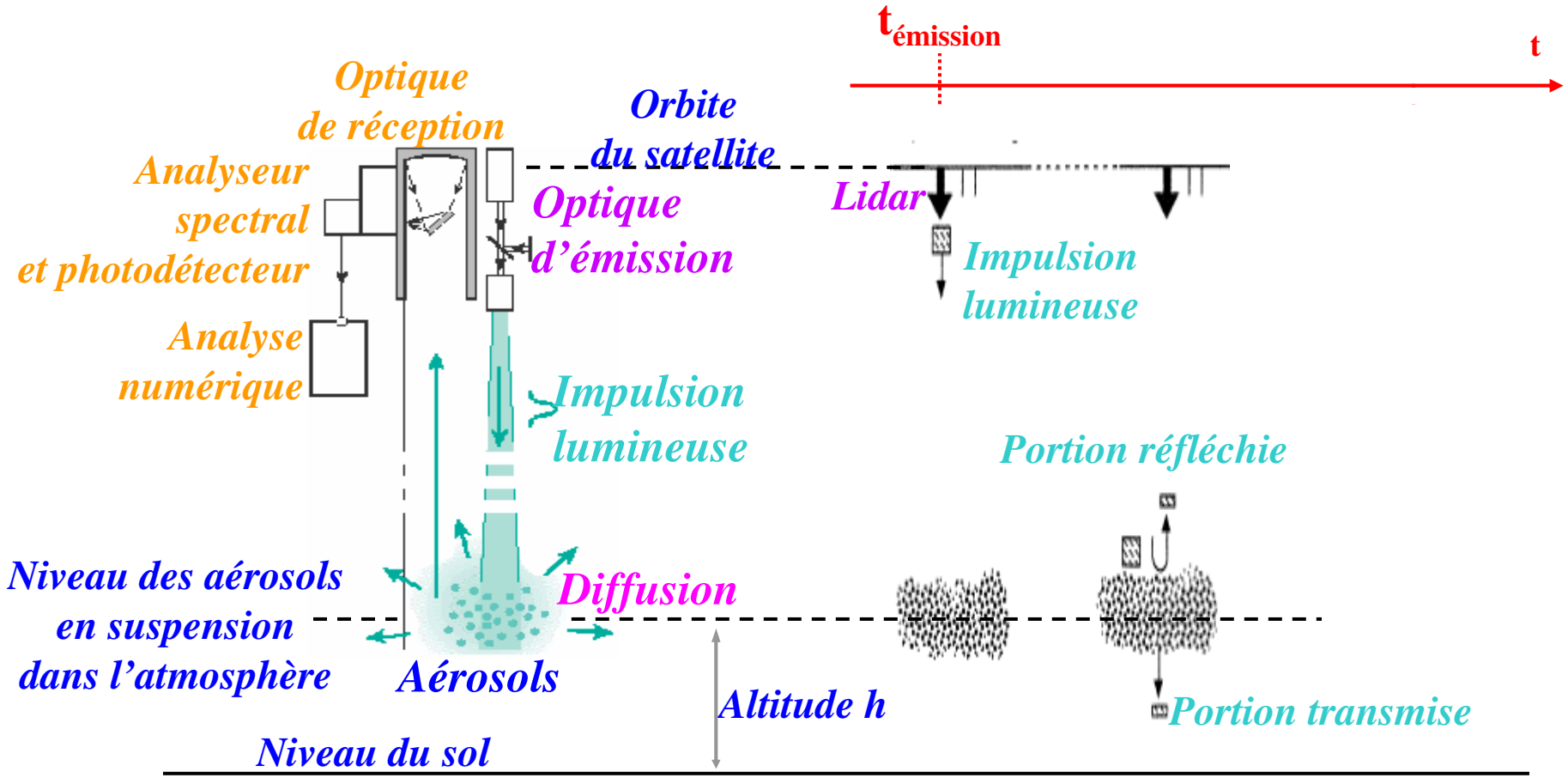


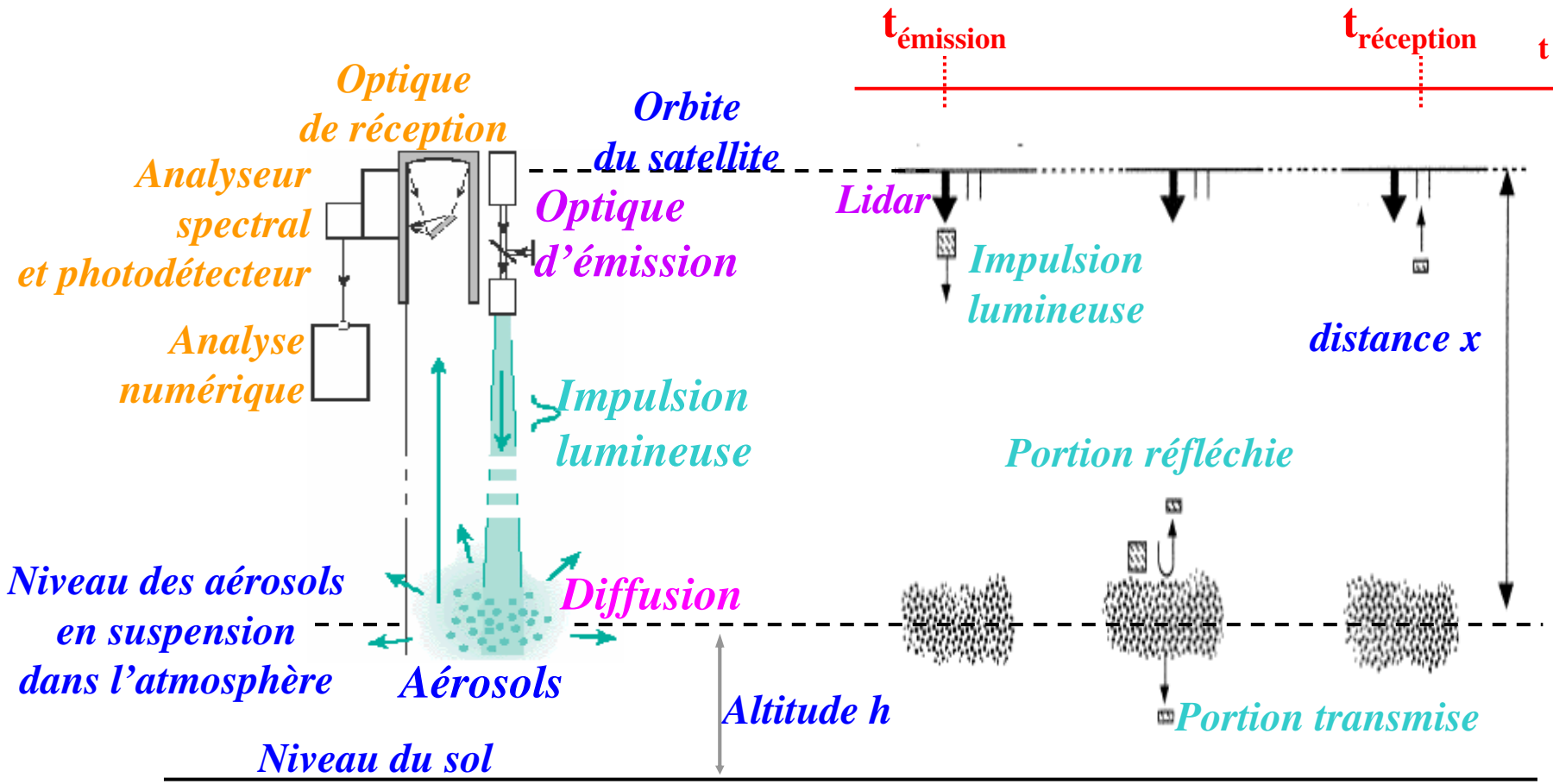
The full-angle field of view of the telescope is 130 microradians, resulting in a footprint at the Earth's surface (from a 705 km orbit) of about 90 meters




Telescope
Lasers

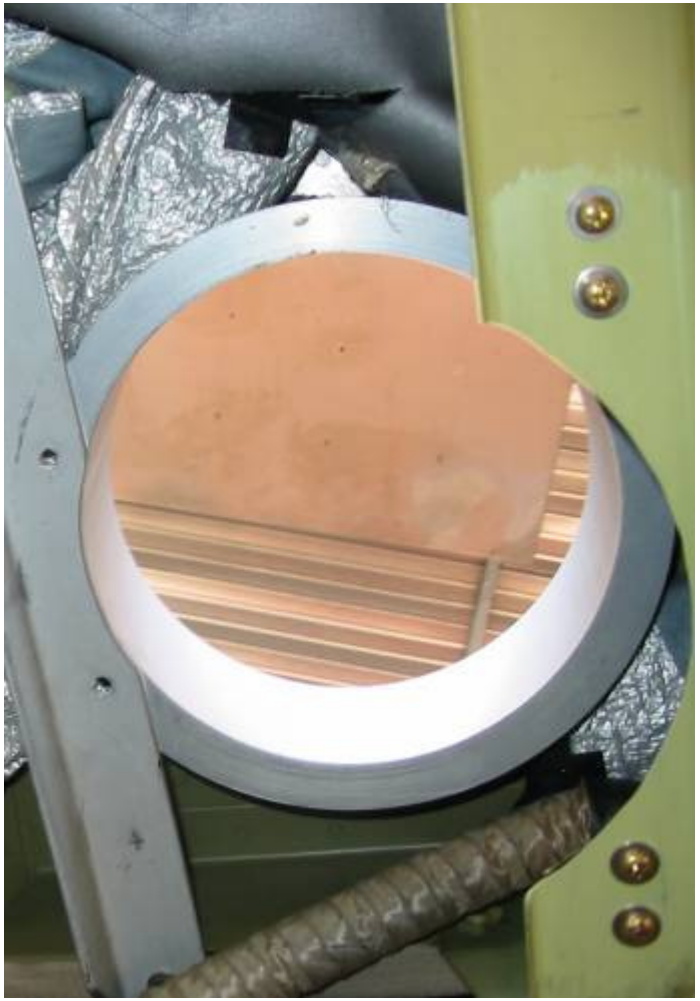

t émission
t
Optique
de réception
Orbite
du satellite
Analyseur
spectral
et photodétecteur
Optique
d'émission
Lidar
Impulsion
lumineuse
Analyse
numérique
Impulsion
lumineuse
Niveau des aérosols
en suspension
dans l'atmosphère
Diffusion
Aérosols
Altitude h
Niveau du sol


t émission
t
Optique
de réception
Orbite
du satellite
Analyseur
spectral
et photodétecteur
Optique
d'émission
Lidar
Impulsion
lumineuse
Analyse
numérique
Impulsion
lumineuse
Portion réfléchie
Niveau des aérosols
en suspension
dans l'atmosphère
Diffusion
Aérosols
Altitude h
Portion transmise
Niveau du sol

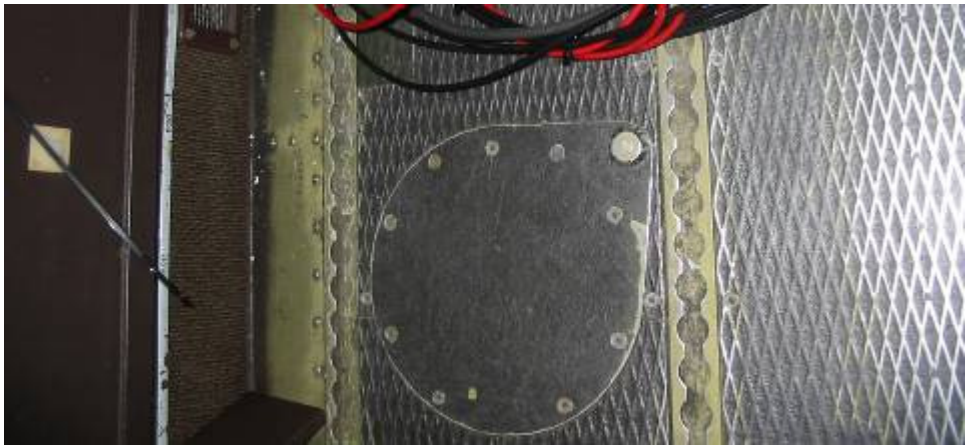


Distance x = c*($t_{réception} - t_{émission}$)/2

Altitude h = altitude de l'orbite du satellite – x = 705 - x

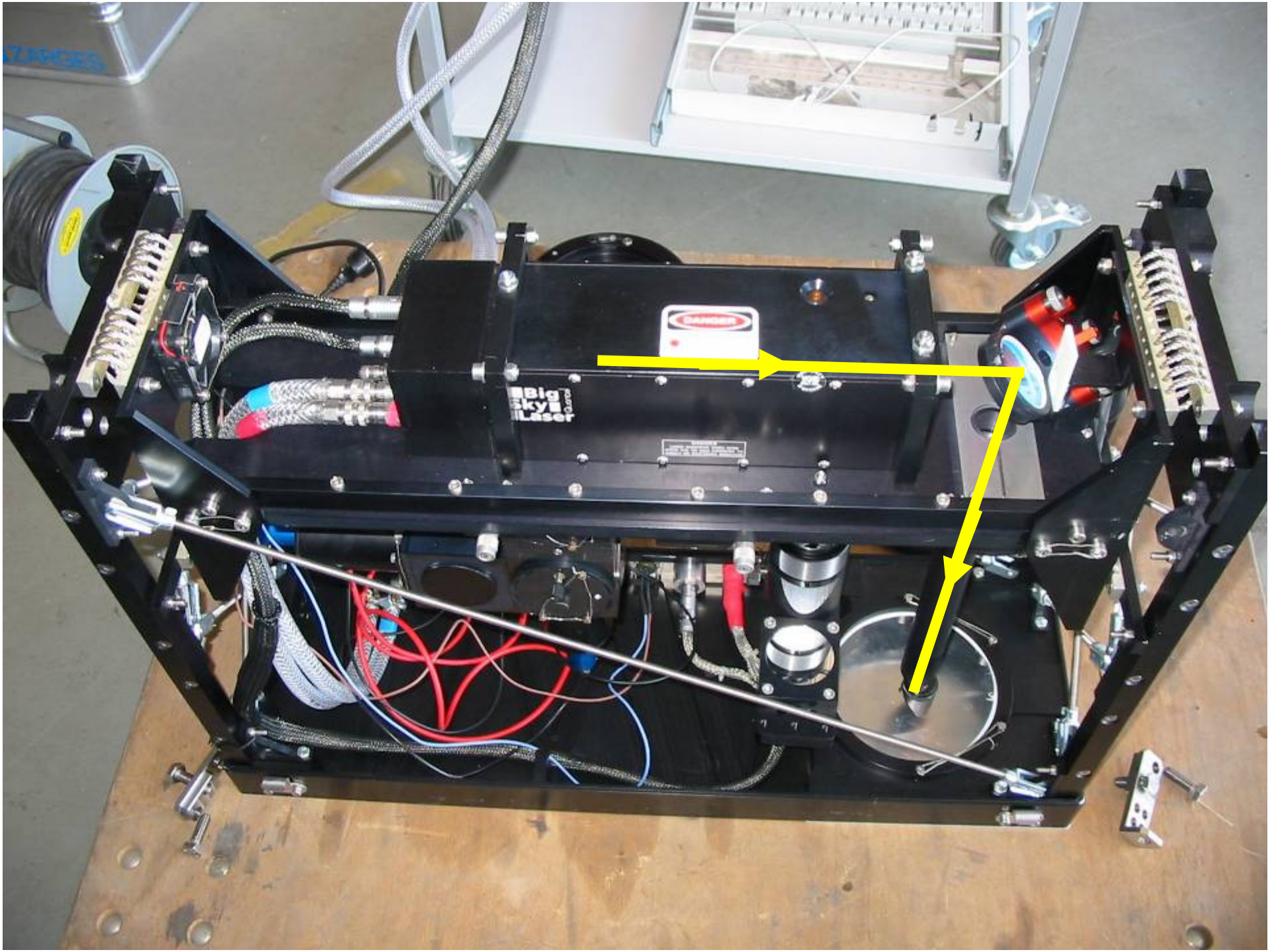


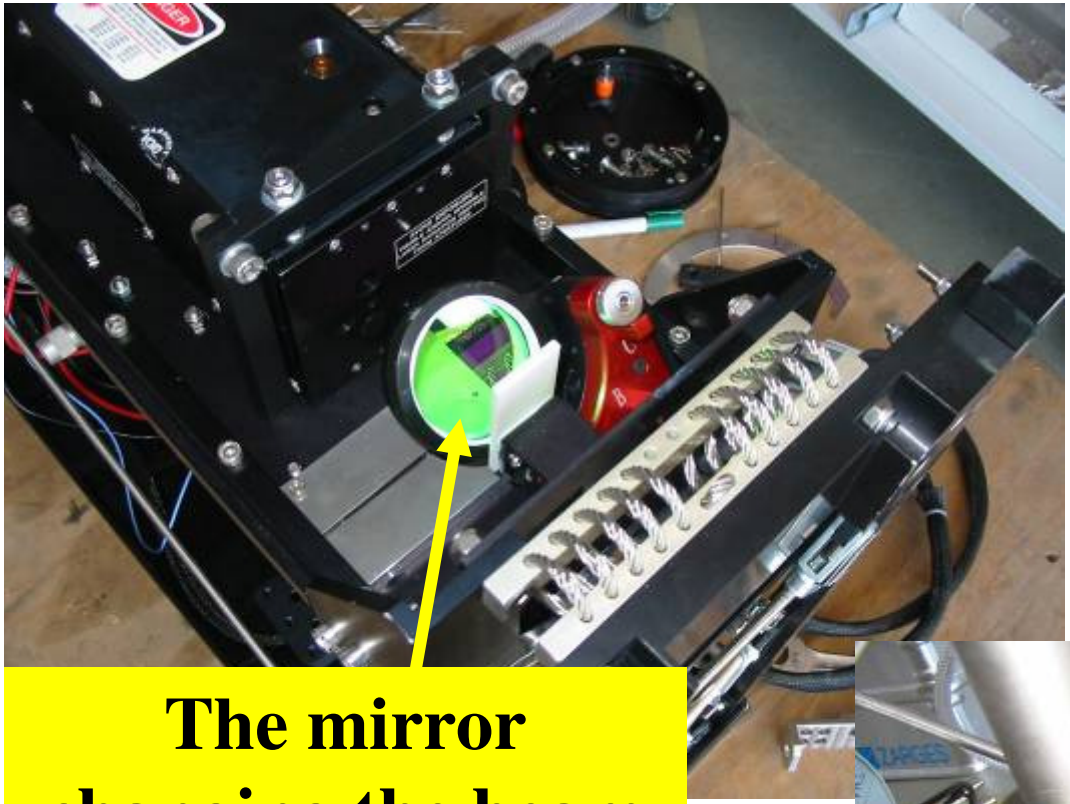
With a hole in the upper part of the plane and one in the plane « floor », the lidar can send « upwelling » light and « downwelling » light.



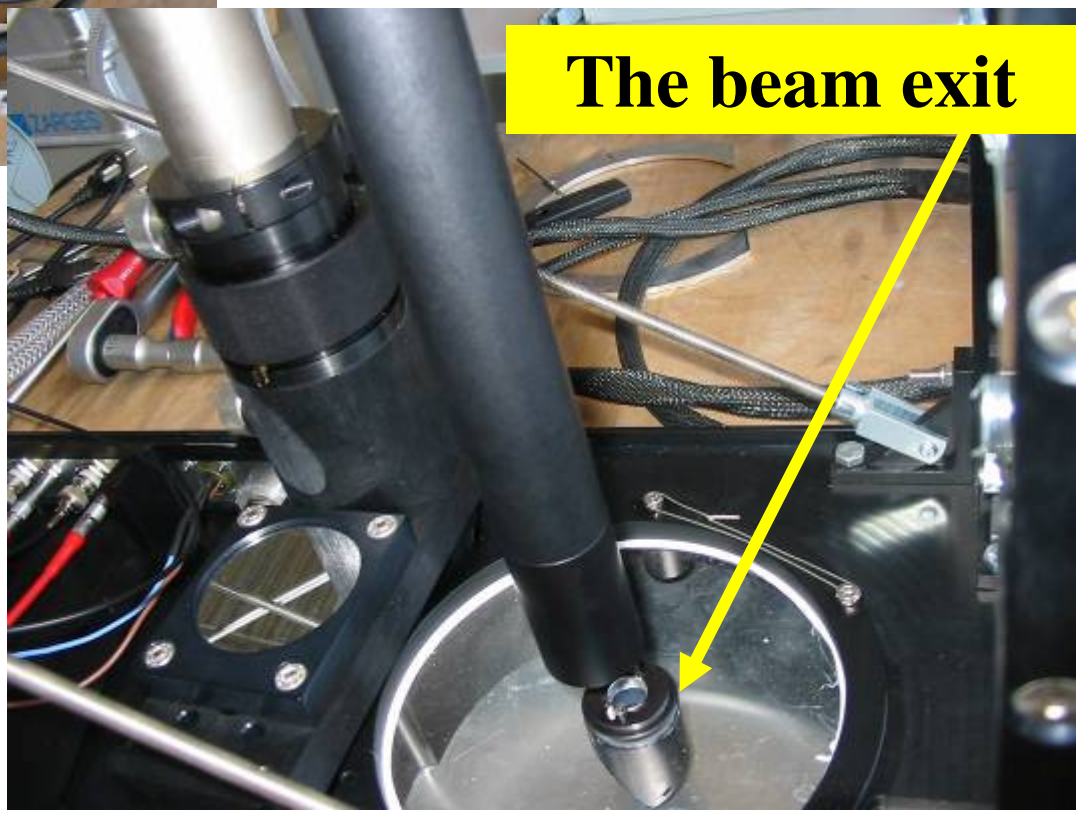
In an « upwelling » position, ready to receive downwards going scattered light.

AMALi – Airborne Mobile Aerosol Lidar

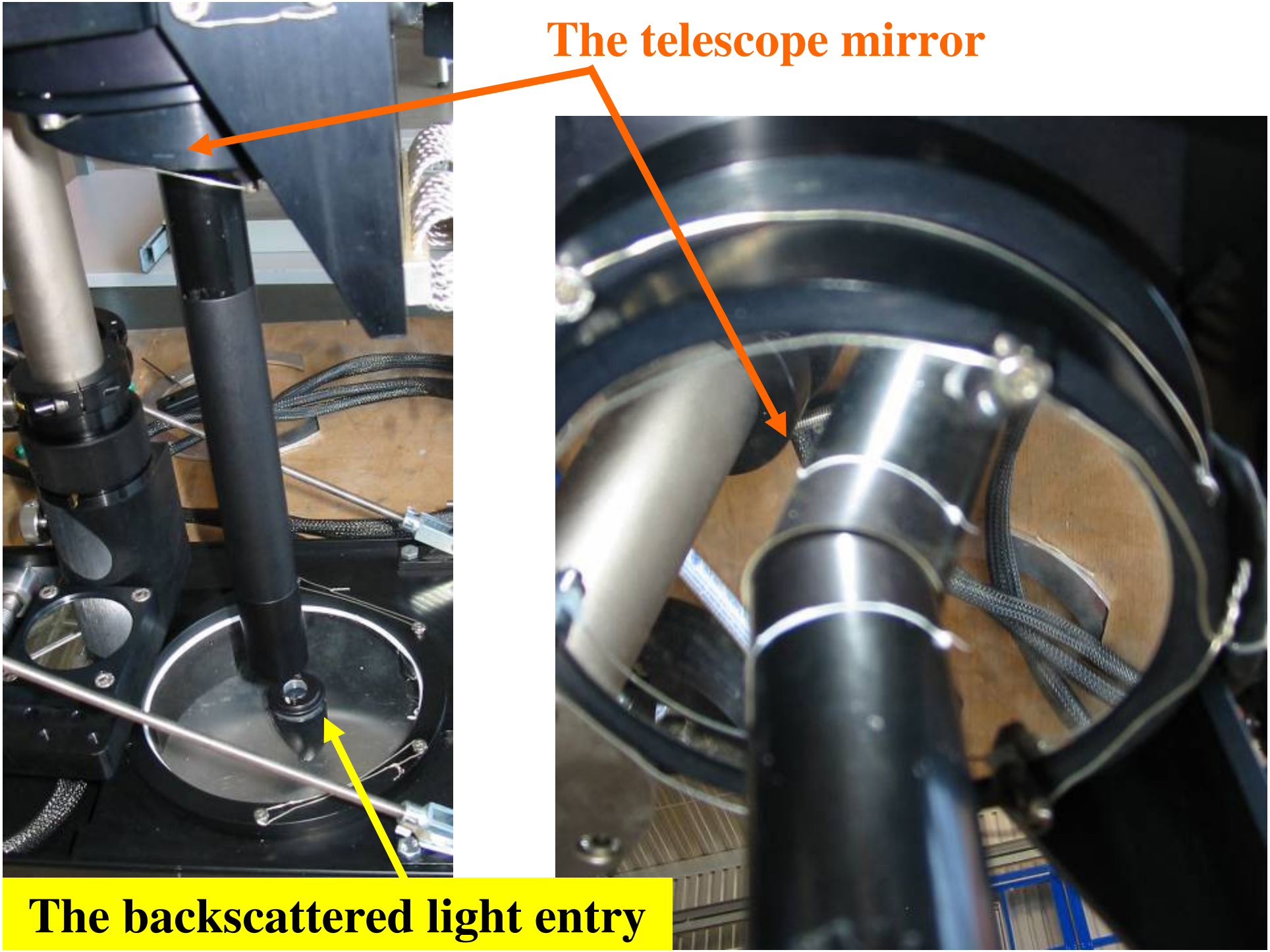

DANGER

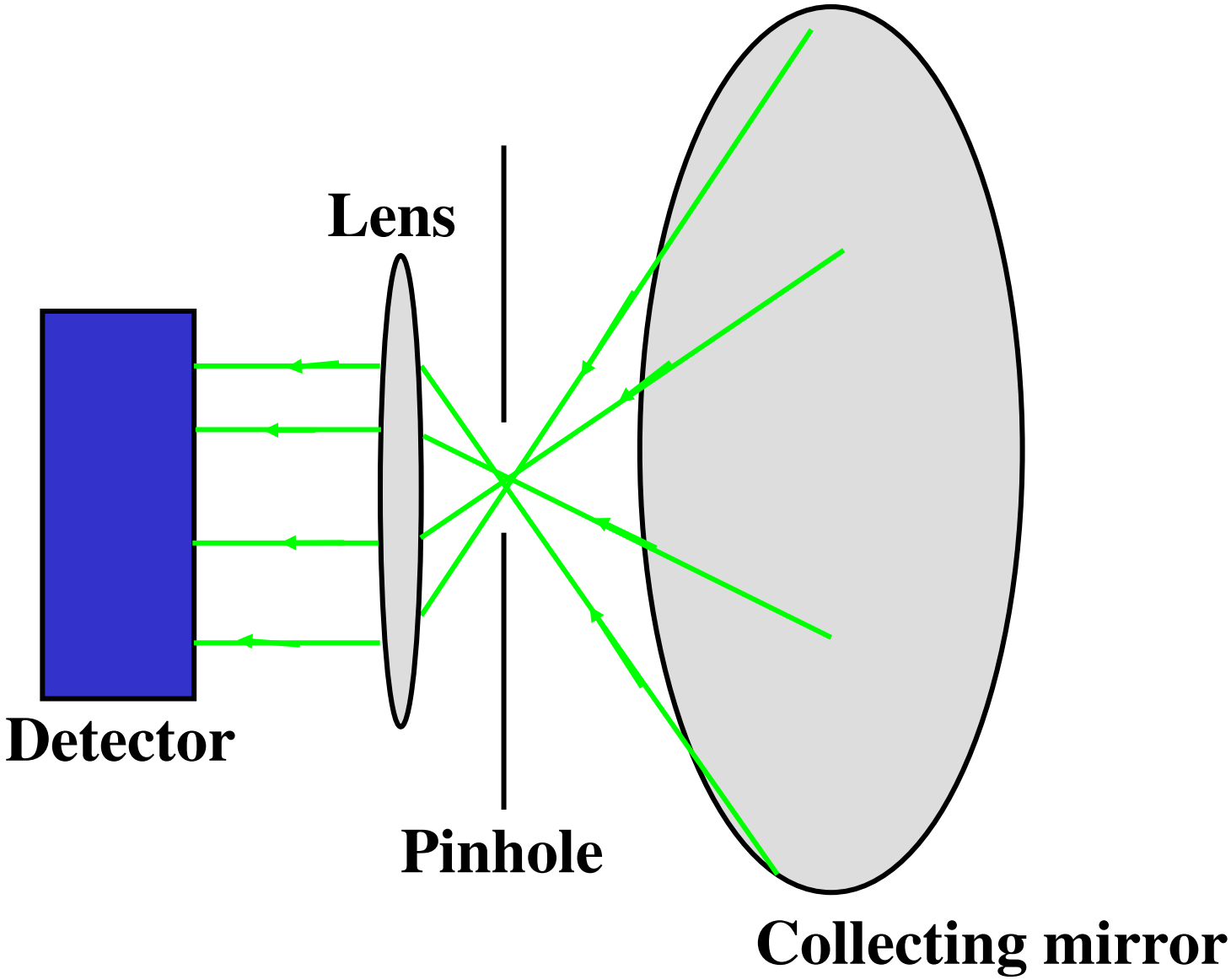


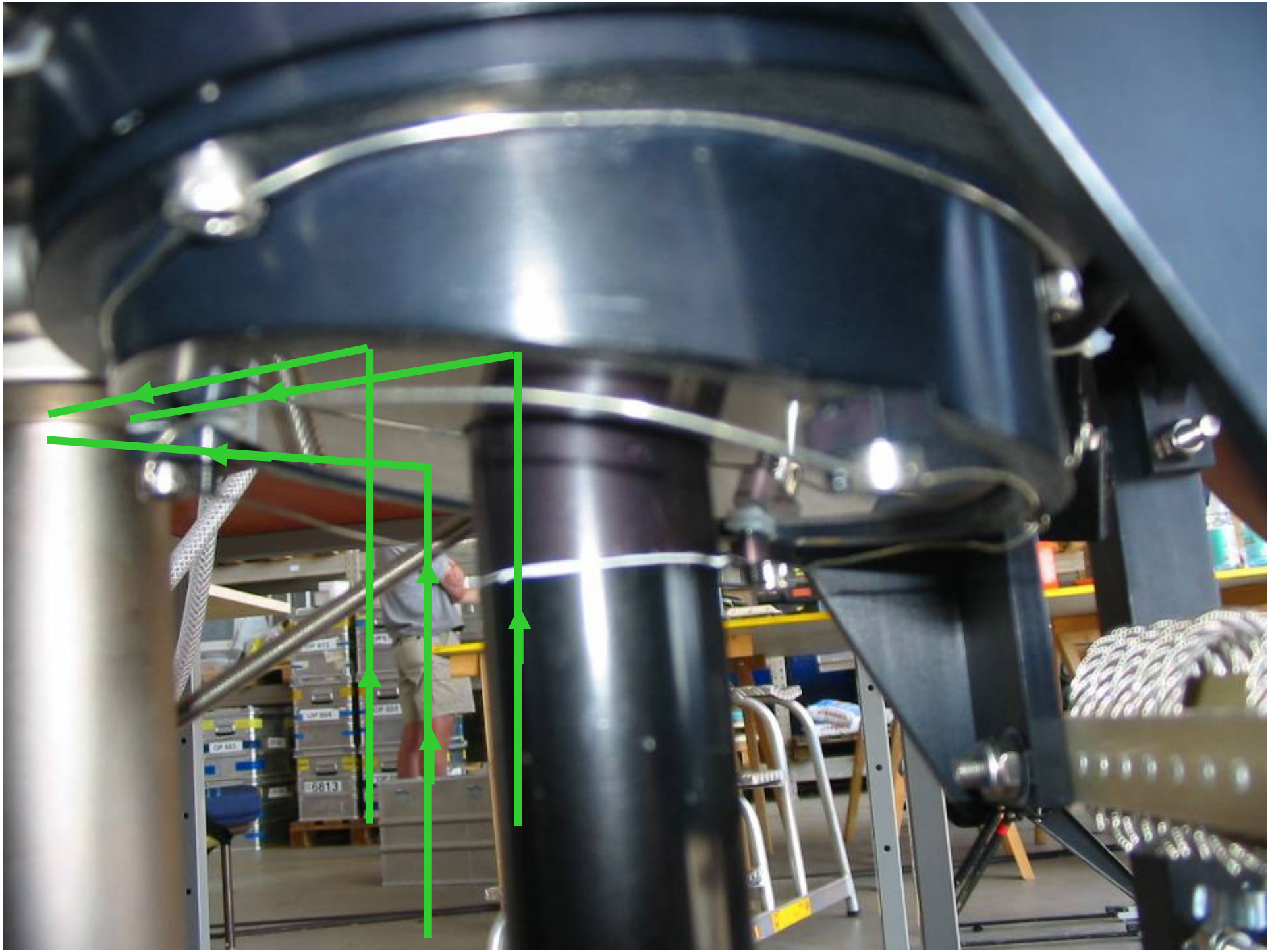
The mirror changing the beam direction



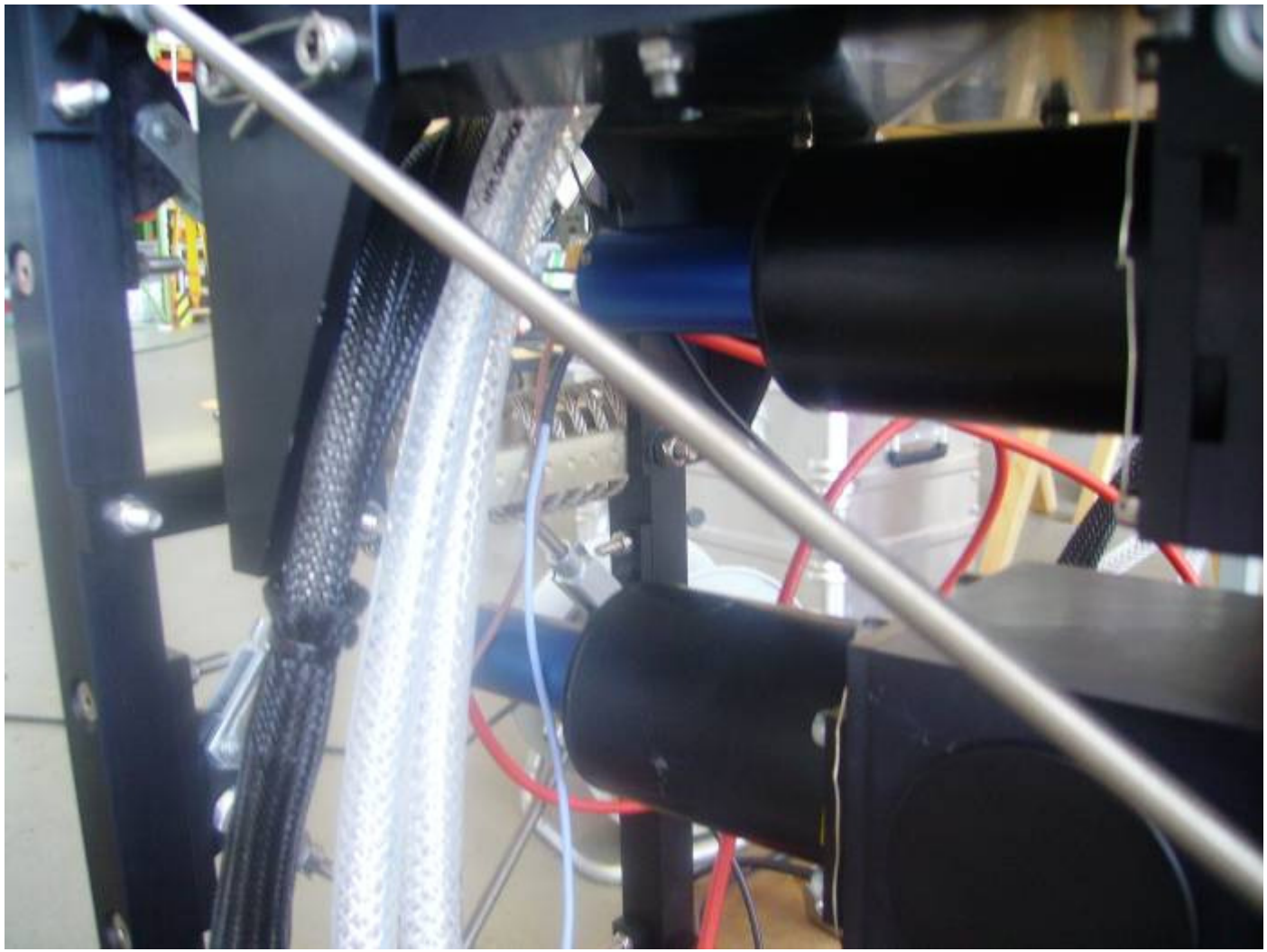
The beam exit

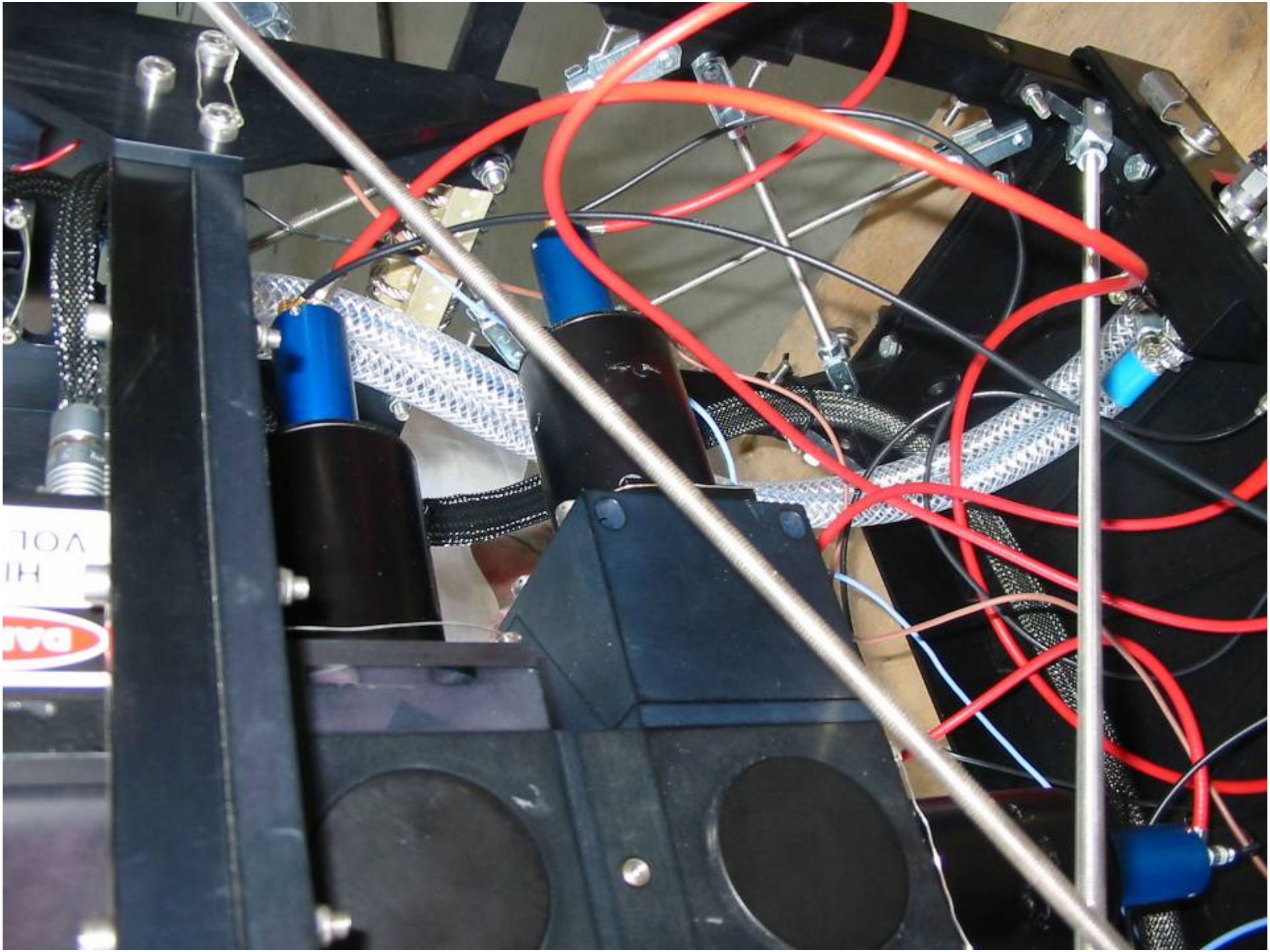

The telescope mirror
The backscattered light entry


Lens
Detector
Pinhole
Collecting mirror

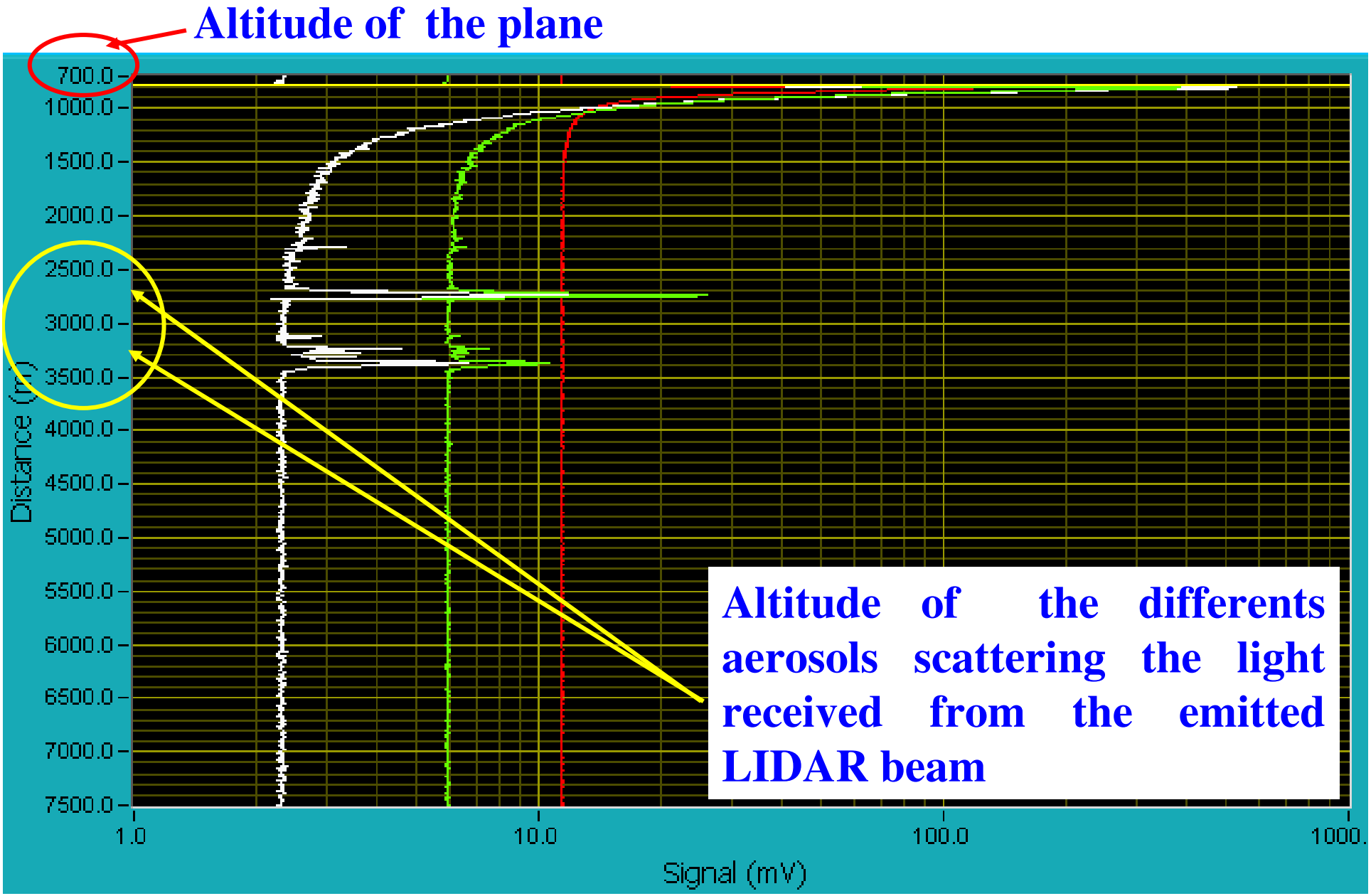


In the detector, a beam splitting device gives 3 beams (one with a 532 nm light, another one with the 1064 nm light and the last one with a 355 nm light) and send these beams on 3 light sensors wich measures how much light they are receiving.

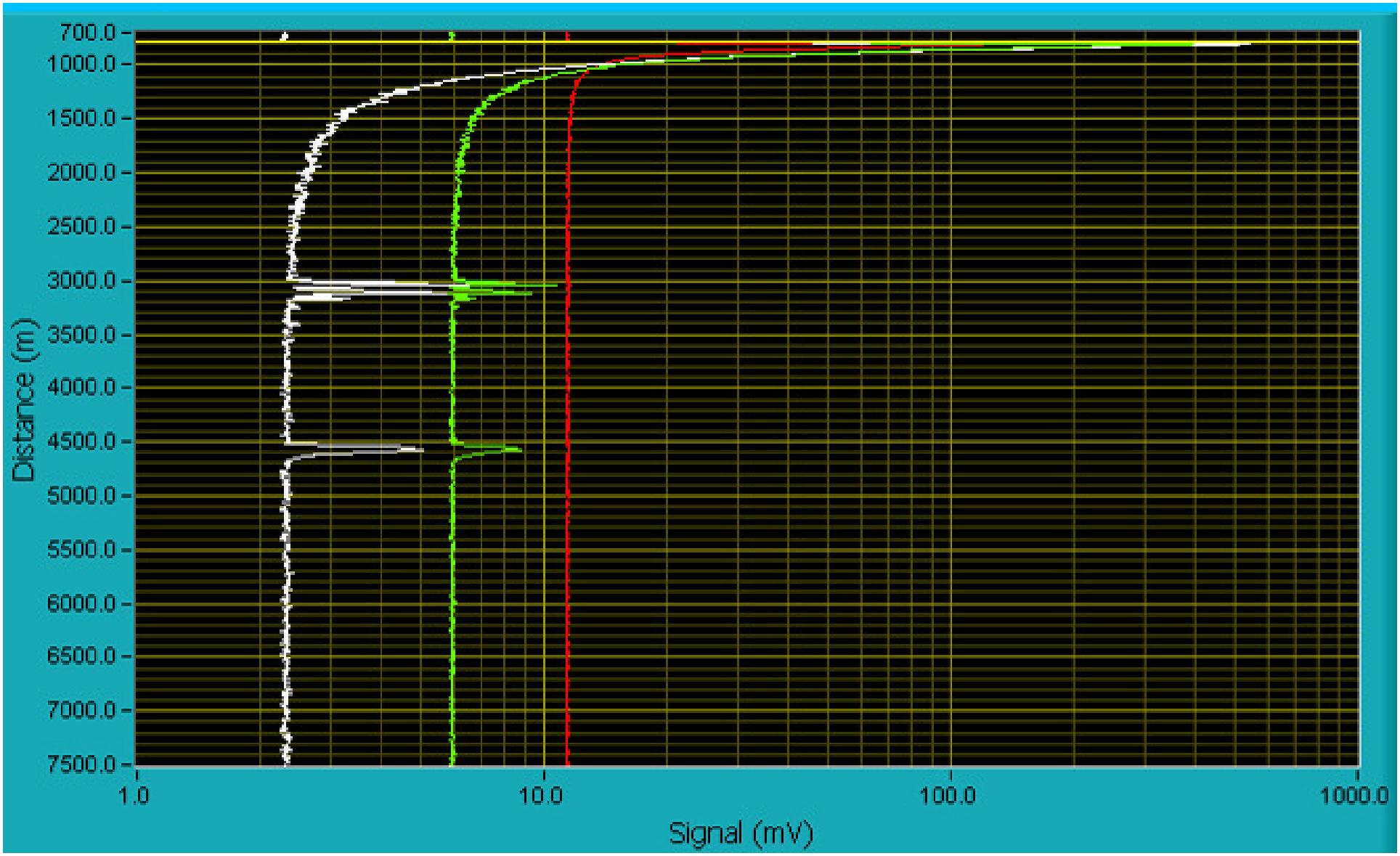




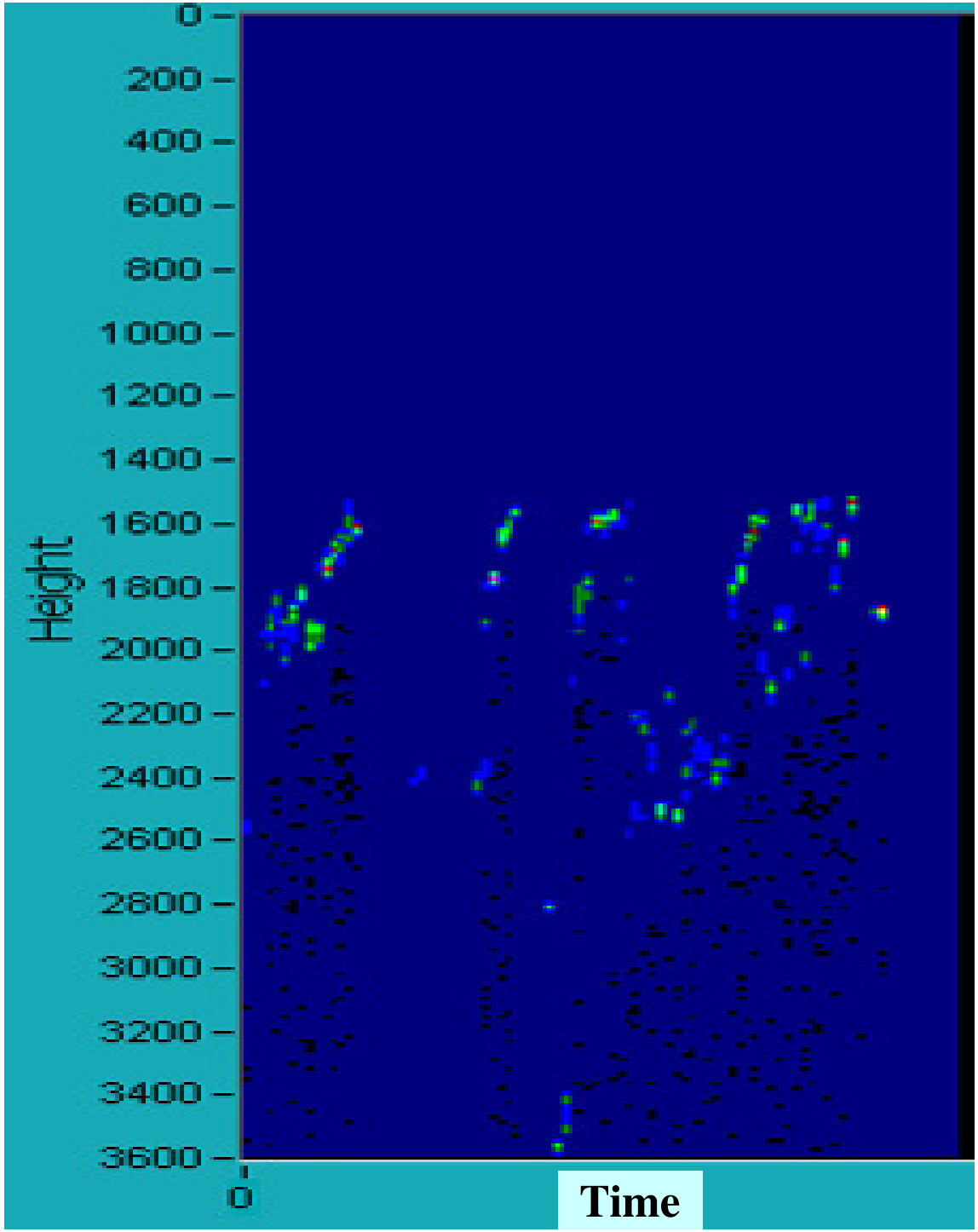
Raw signal (upwards beam)

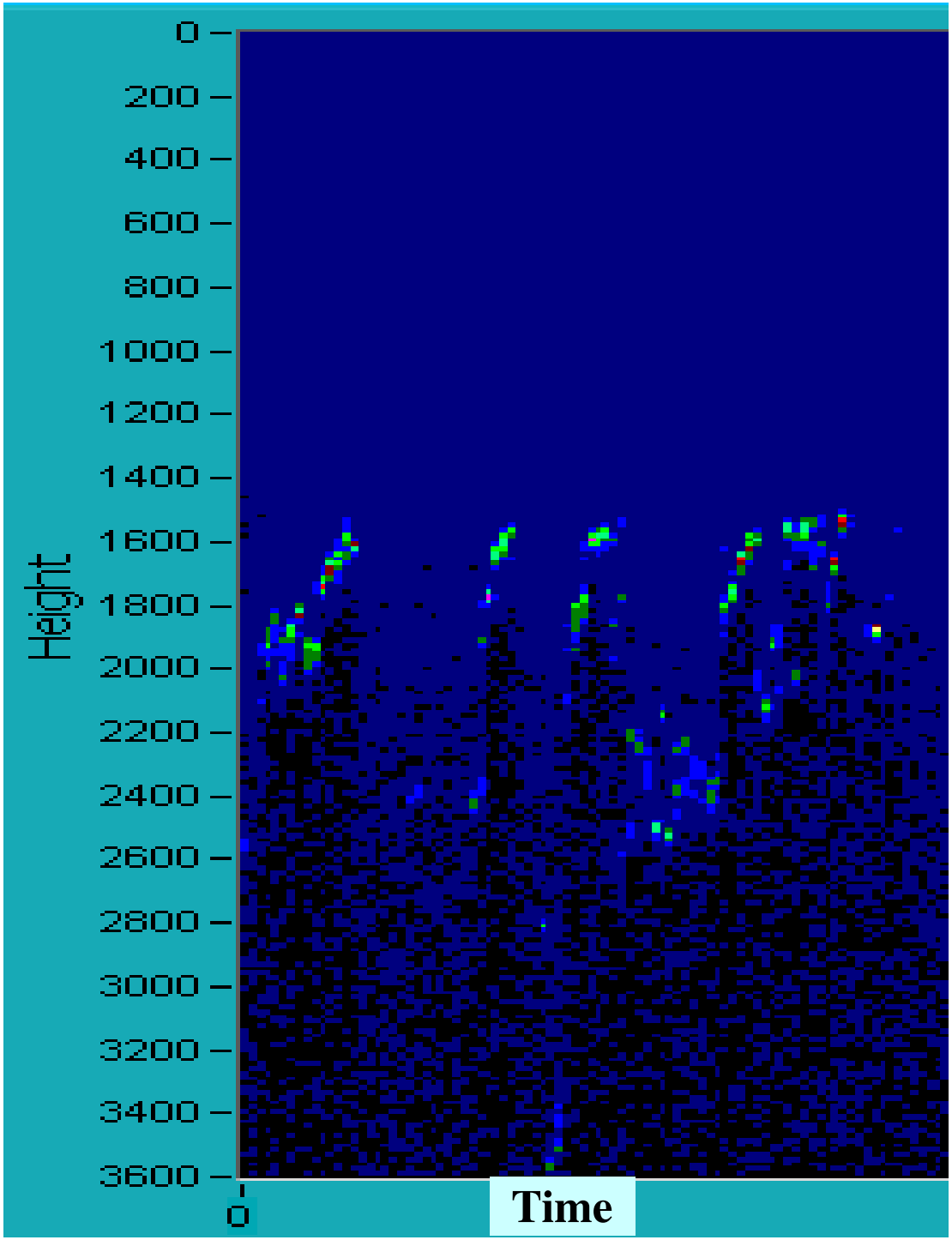


Raw signal (upwards beam)



Backscatter time series
532 nm (green)

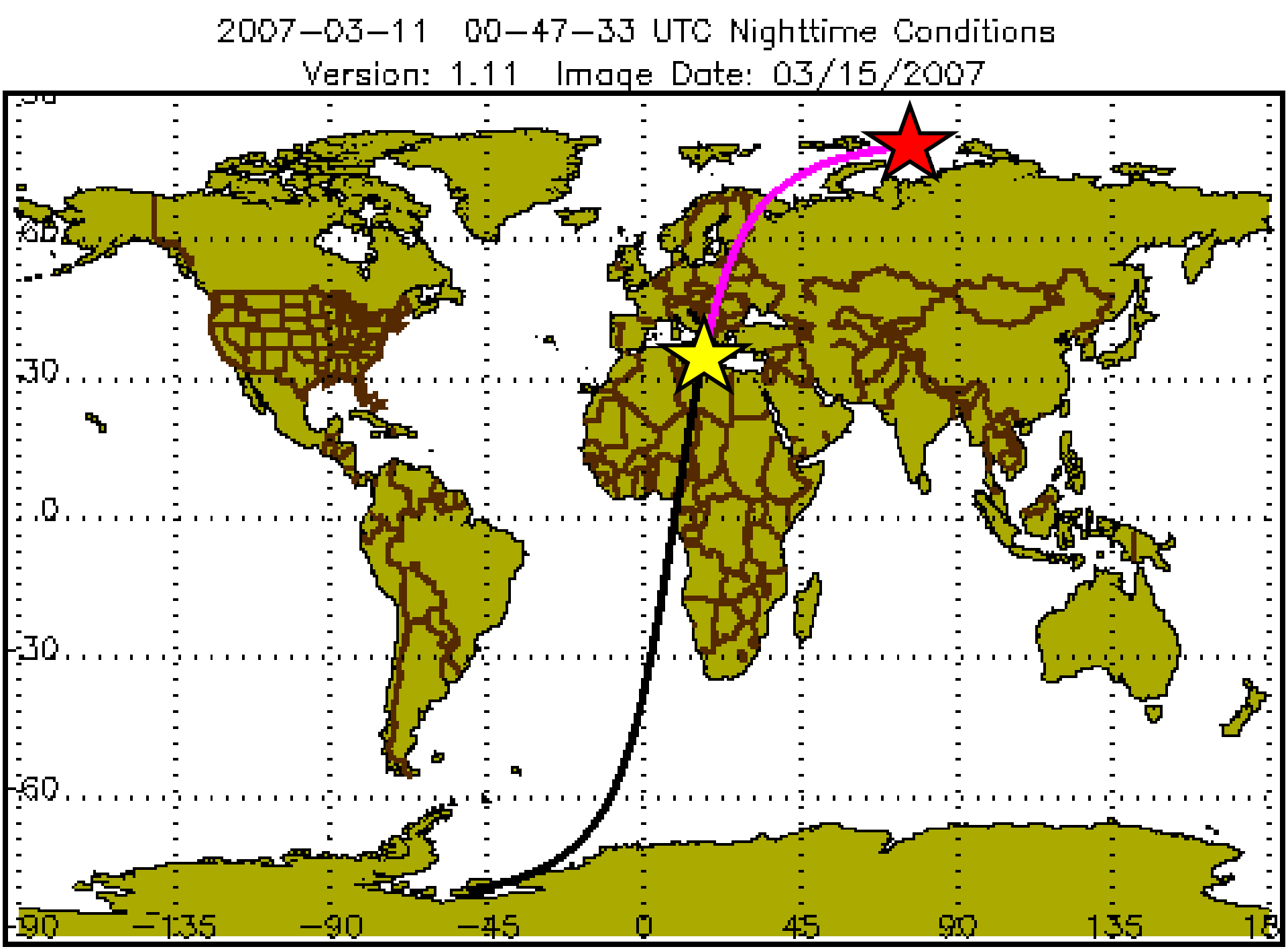




Backscatter time series
355 nm (UV)

Un profil atmosphérique vu par CALIPSO

le 11 Mars 2007


2007-03-11 00-47-33 UTC Nighttime Conditions
Version: 1.11 Image Date: 03/15/2007
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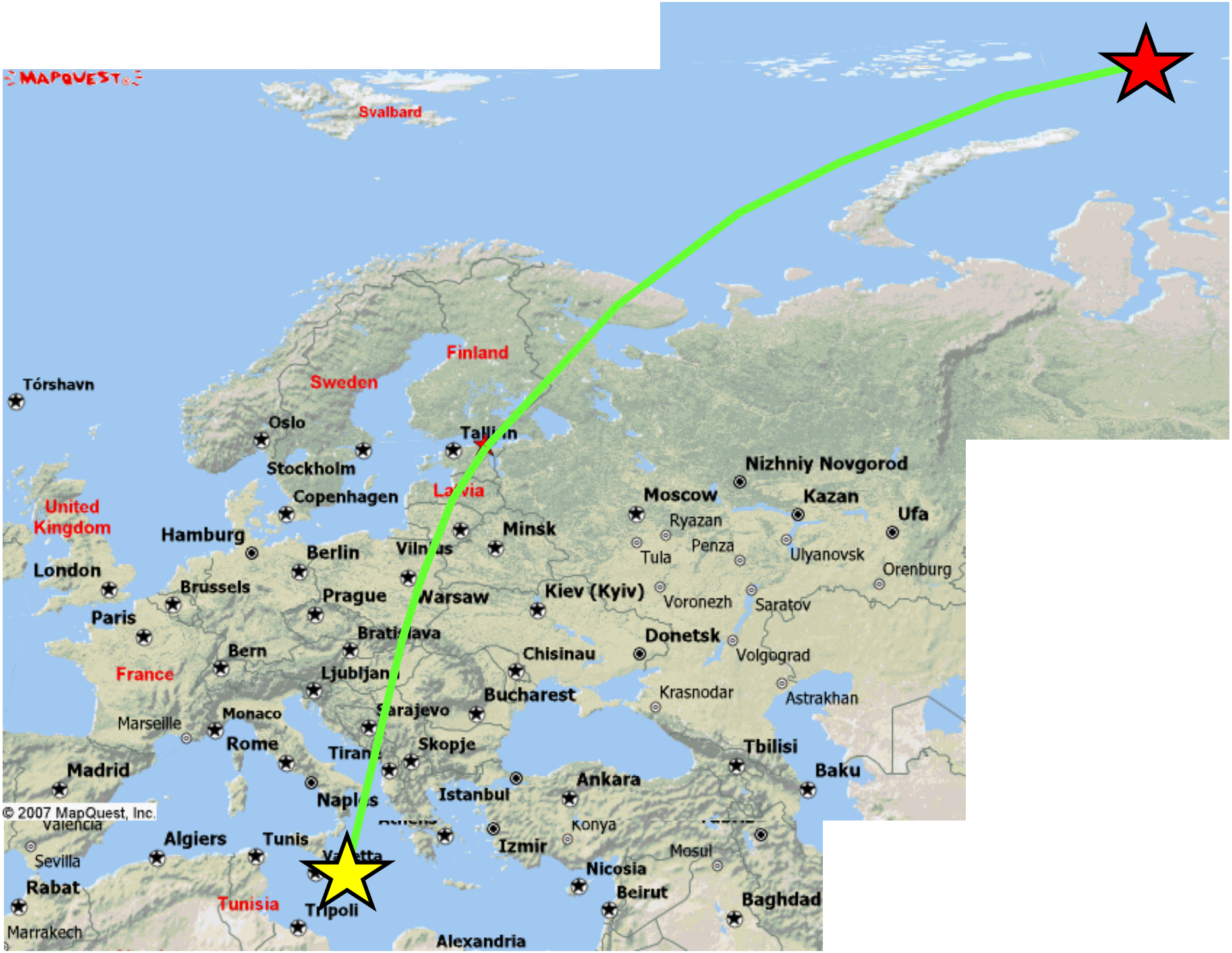
90
135
18


MAPQUEST
Svalbard
Finland
Sweden
Tórshavn
Oslo
Stockholm
Copenhagen
Latvia
United Kingdom
Hamburg
Berlin
Minsk
London
Brussels
Prague
Warsaw
Kiev (Kyiv)
Paris
Bern
France
Chisinau
Bucharest
Monaco
Marseille
Rome
Skopje
Madrid
Istanbul
Ankara
Tbilisi
Baku
Algiers
Tunis
Izmir
Konya
Sevilla
Rabat
Tunisia
Tripoli
Nicosia
Beirut
Baghdad
Marrakech
Alexandria
Nizhniy Novgorod
Moscow
Kazan
Ufa
Ryazan
Penza
Tula
Ulyanovsk
Orenburg
Voronezh
Saratov
Donetsk
Volgograd
Krasnodar
Astrakhan
Mosul
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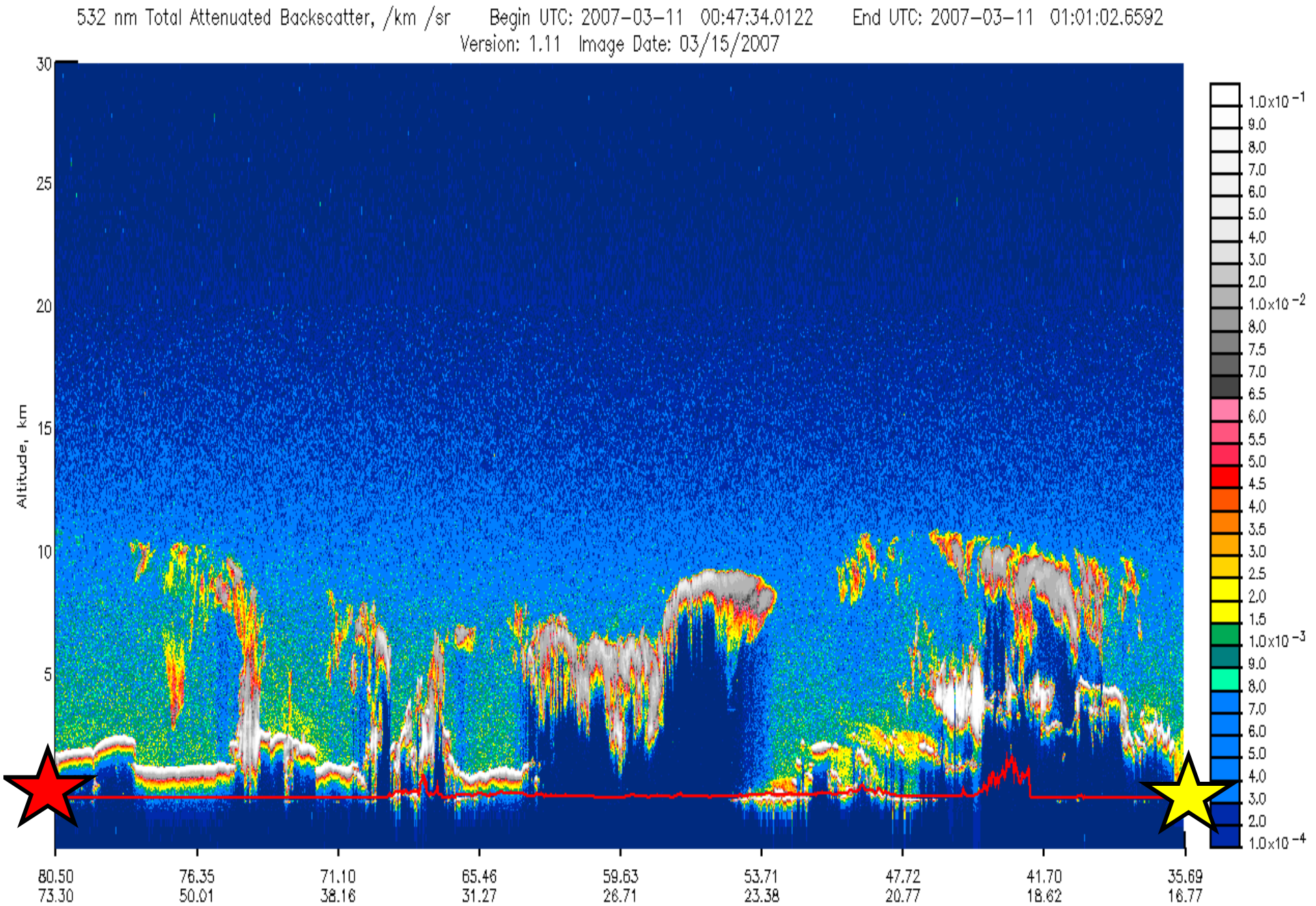
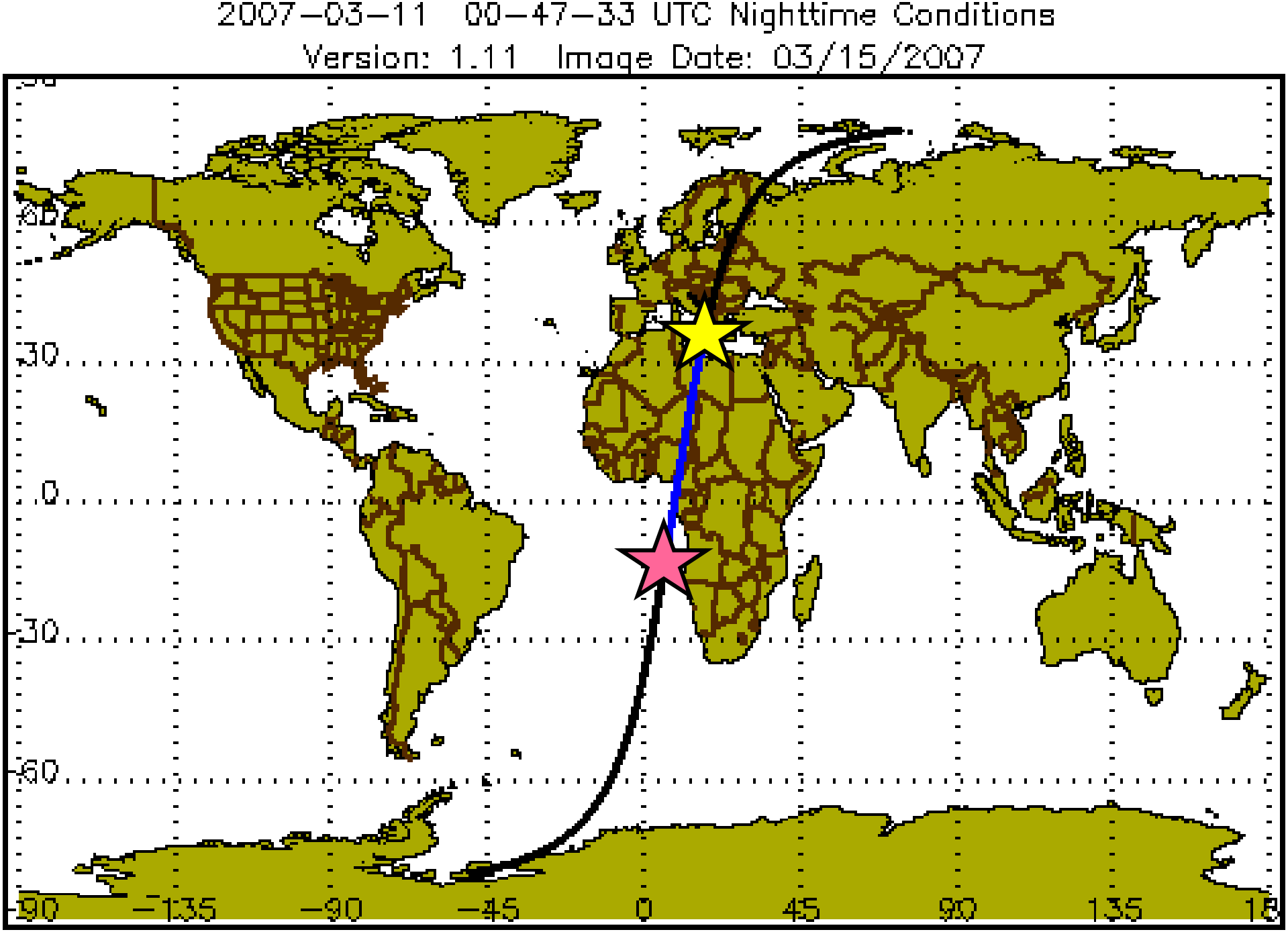

532 nm Total Attenuated Backscatter, /km /sr
Begin UTC: 2007-03-11 00:47:34.0122
End UTC: 2007-03-11 01:01:02.6592
Version: 1.11 Image Date: 03/15/2007
Altitude, km
30
25
20
15
10
5
1.0x10 -1
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0x10 -2
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0x10 -3
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0x10 -4
80.50
73.30
76.35
50.01
71.10
38.16
65.46
31.27
59.63
26.71
53.71
23.38
47.72
20.77
41.70
18.62
35.69
16.77


2007-03-11 00-47-33 UTC Nighttime Conditions
Version: 1.11 Image Date: 03/15/2007
60
30
0
-30
-60
-90
-135
-90
-45
0
45
90
135
180


Madrid
Barcelona
Naples
Portugal
Valencia
Sevilla
Algiers
Tunis
Rabat
Marrakech
Tunisia
Istanbul
Ankara
Yerevan
Athens
Konya
Izmir
Tabriz
Baku
Mosul
Nicosia
Beirut
Baghdad
Alexandria
Kuwait City
Cairo
Libya
Egypt
Saudi Arabia
Western Sahara
Jeddah
Nouakchott
Niger
Mali
Khartoum
Sanaa
Praia
Dakar
Niamey
Chad
Asmara
Sudan
Banjul
Bissau
Burkina Faso
N'Djamena
Benin
Conakry
Addis Ababa
Freetown
Yamoussoukro
Porto-Novo
Lomé
Abidjan
Yaound
Bangui
Malabo
São Tom
Libreville
Uganda
Kenya
Gabon
Kigali
Bujumbura
Nairobi
Kinshasa
Tanzania
Luanda
Angola
Zambia
Lilongwe
Lusaka
St. Helena
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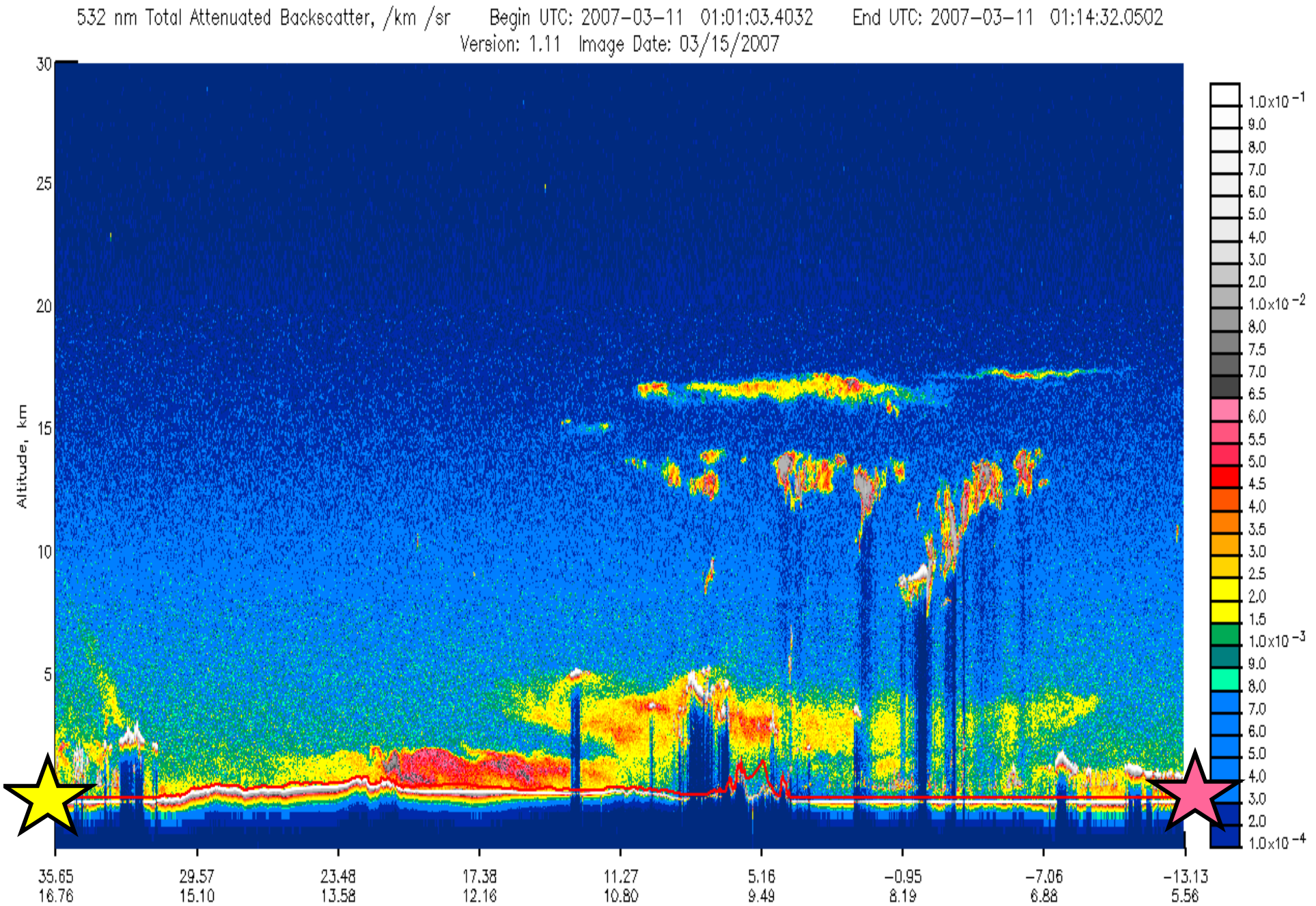
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End UTC: 2007-03-11 01:14:32.0502
Version: 1.11 Image Date: 03/15/2007
Altitude, km
30
25
20
15
10
5
1.0x10 -1
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0x10 -2
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0x10 -3
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0x10 -4
35.65
16.76
29.57
15.10
23.48
13.58
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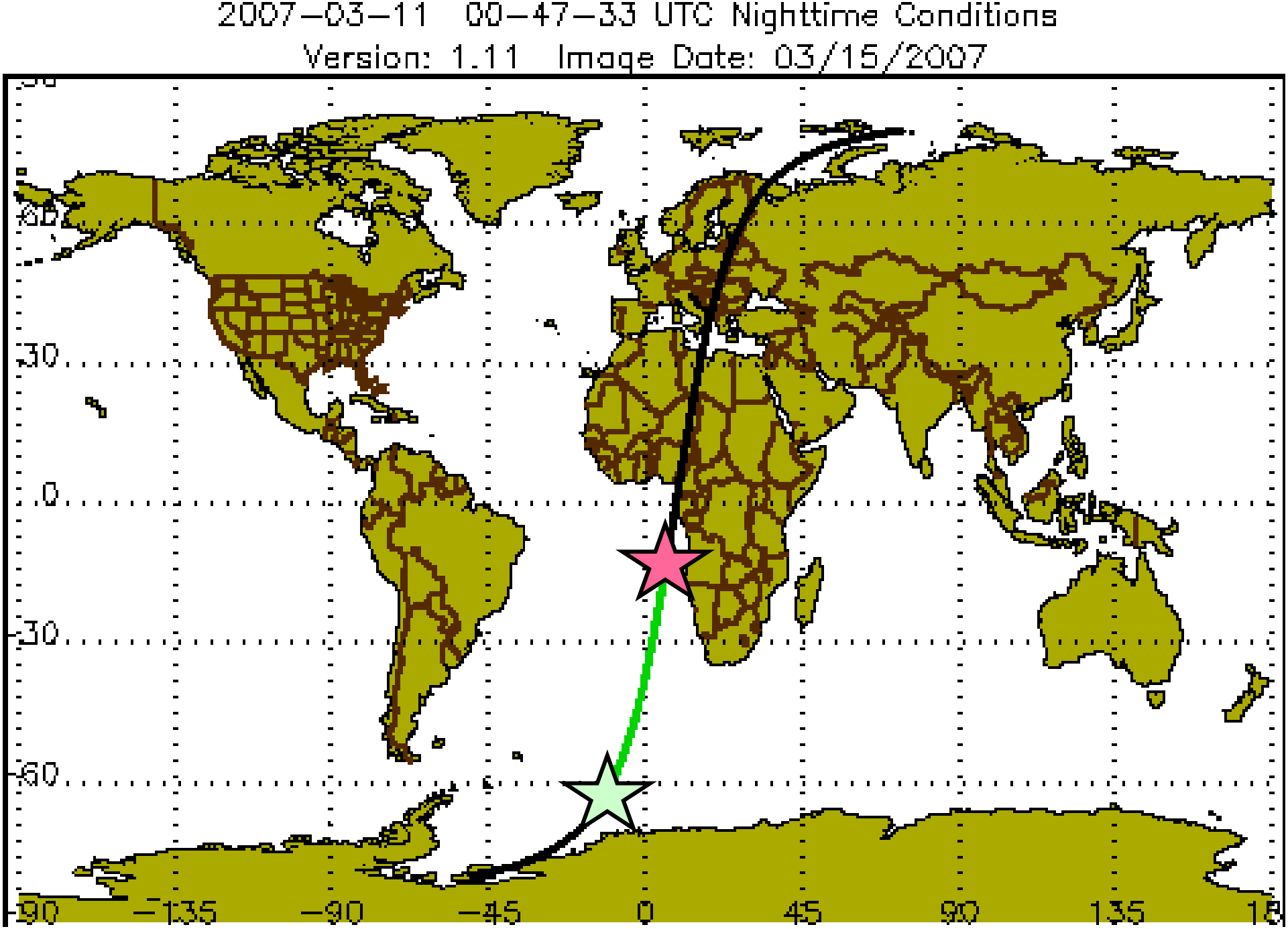
5.56


2007-03-11 00-47-33 UTC Nighttime Conditions
Version: 1.11 Image Date: 03/15/2007
60
30
0
-30
-60
-90
-135
-90
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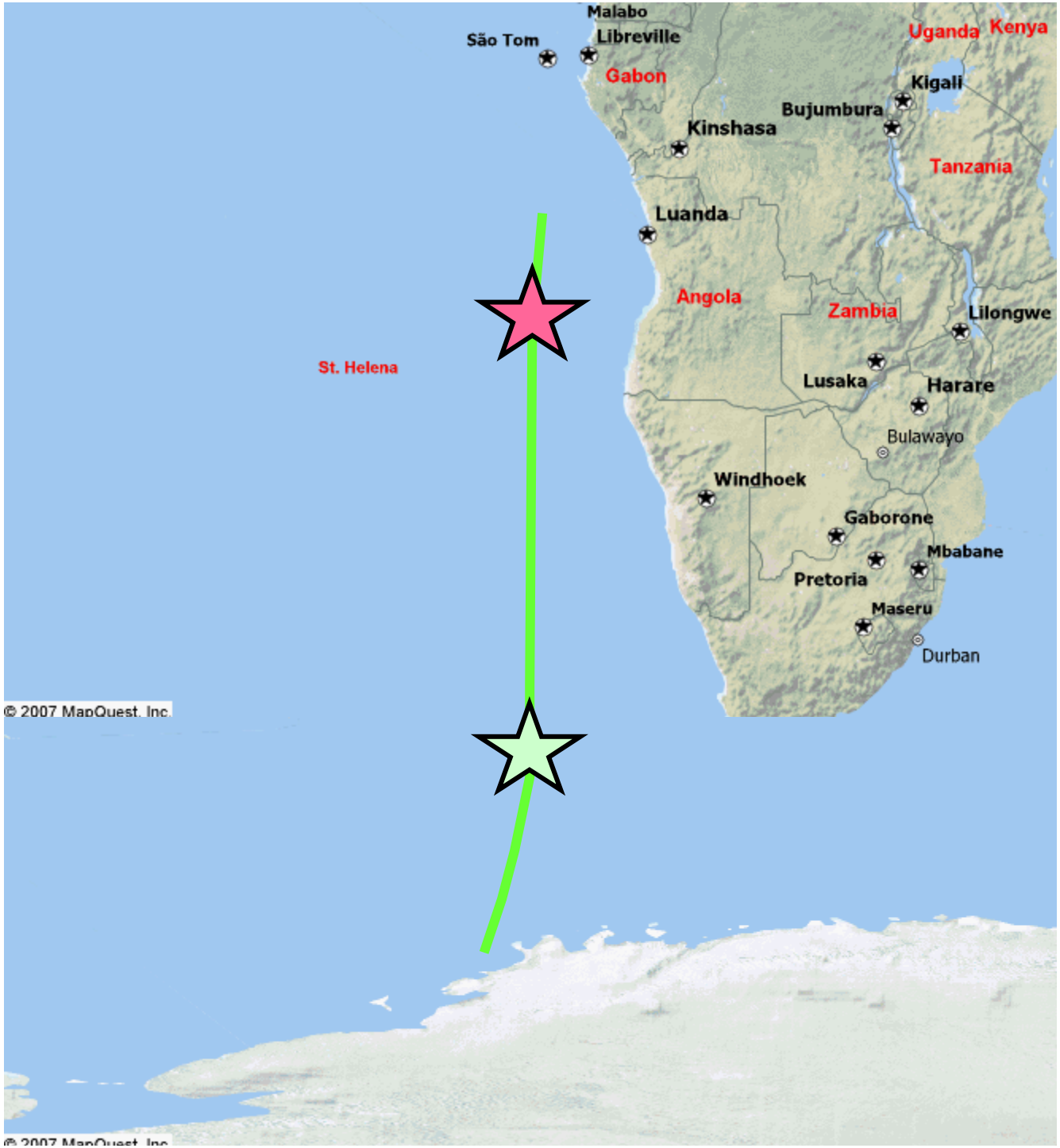
0
45
90
135


Malabo
São Tom
Libreville
Gabon
Uganda
Kenya
Kigali
Bujumbura
Kinshasa
Tanzania
Luanda
Angola
Zambia
Lilongwe
St. Helena
Lusaka
Harare
Bulawayo
Windhoek
Gaborone
Mbabane
Pretoria
Maseru
Durban
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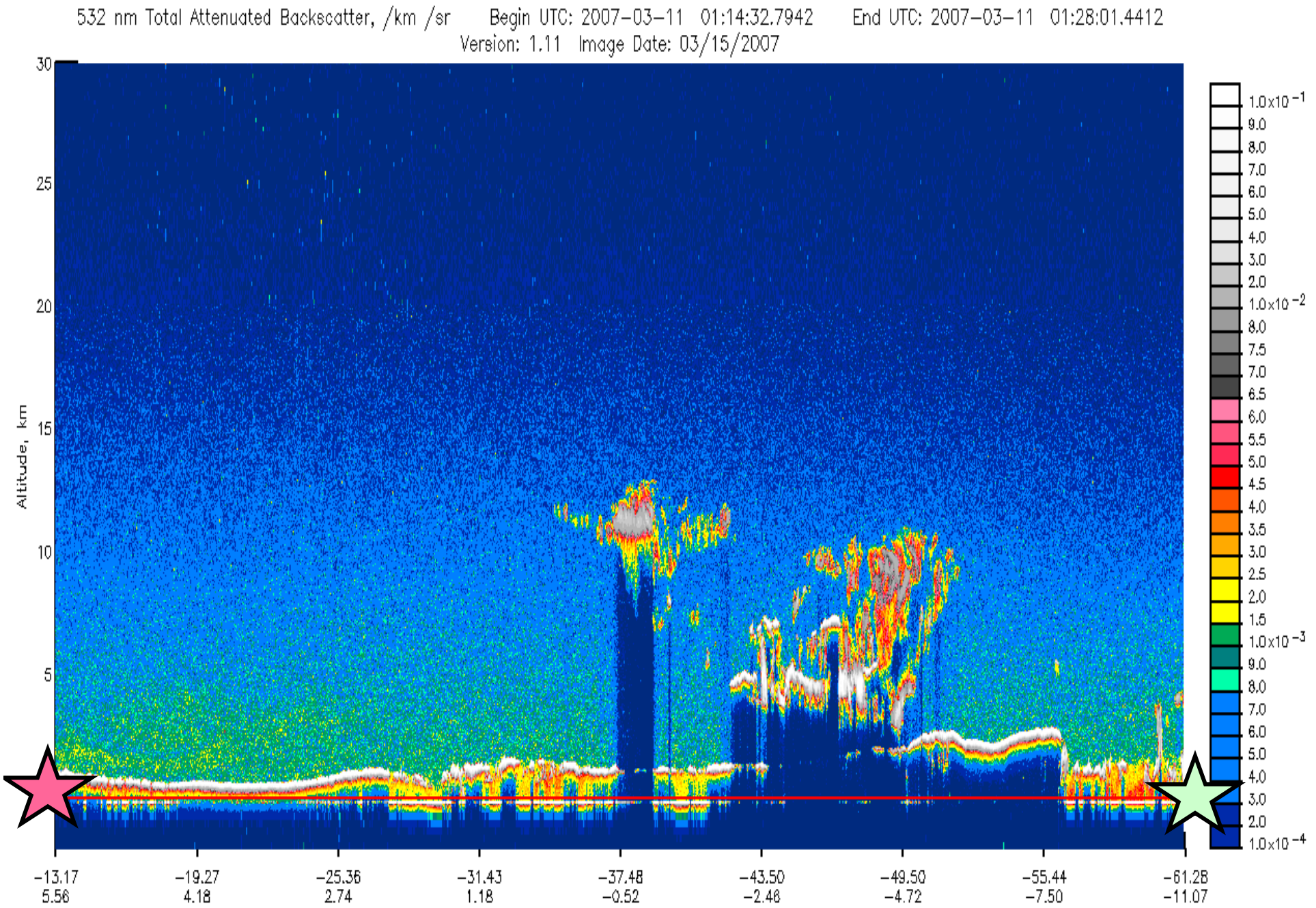
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Version: 1.11 Image Date: 03/15/2007
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30
25
20
15
10
5
1.0x10 -1
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0x10 -2
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0x10 -3
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0x10 -4
-13.17
5.56
-19.27
4.18
-25.36
2.74
-31.43
1.18
-37.48
-0.52
-43.50
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-49.50
-4.72
-55.44
-7.50
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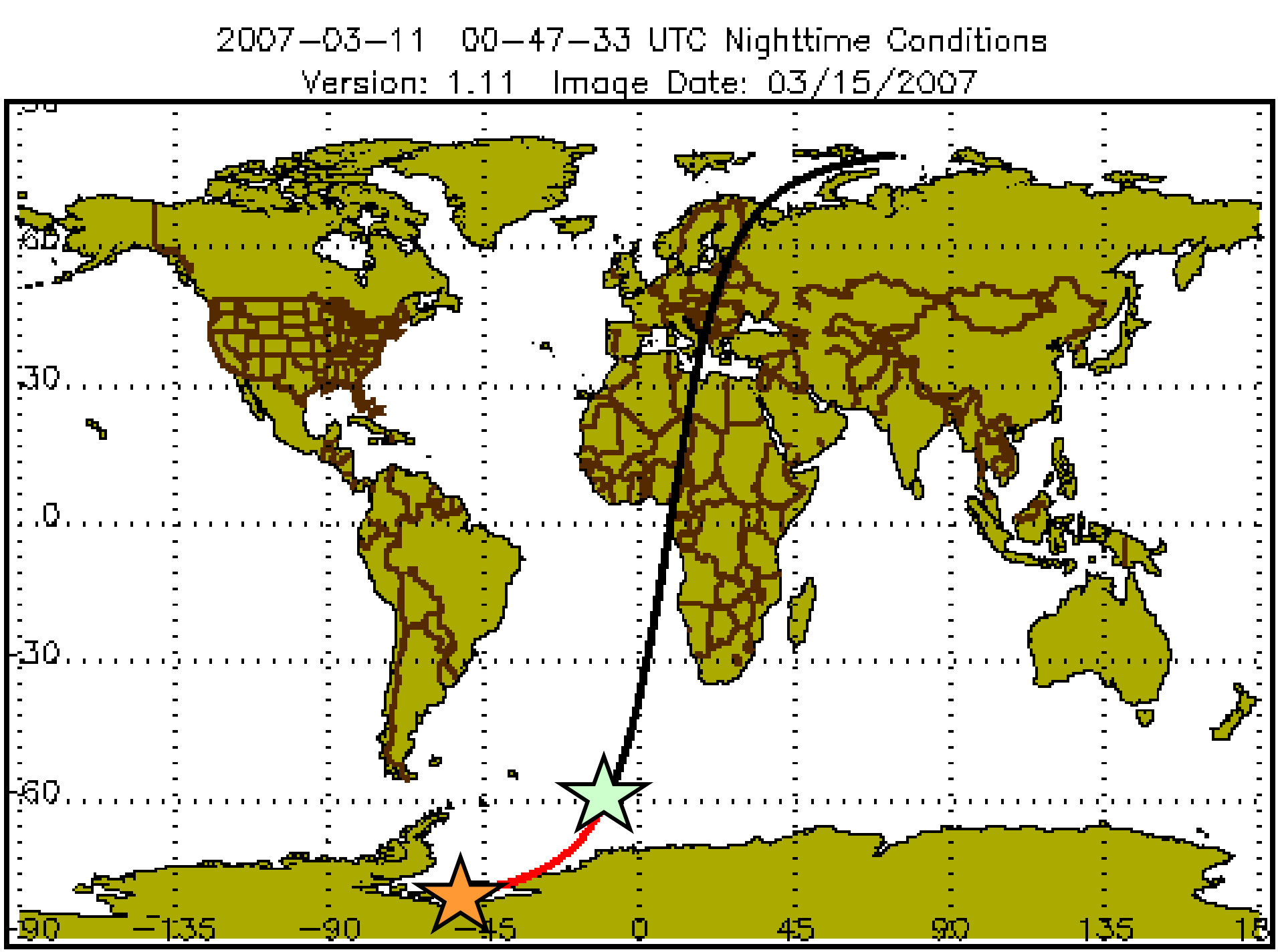
-11.07


2007-03-11 00-47-33 UTC Nighttime Conditions
Version: 1.11 Image Date: 03/15/2007
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-30
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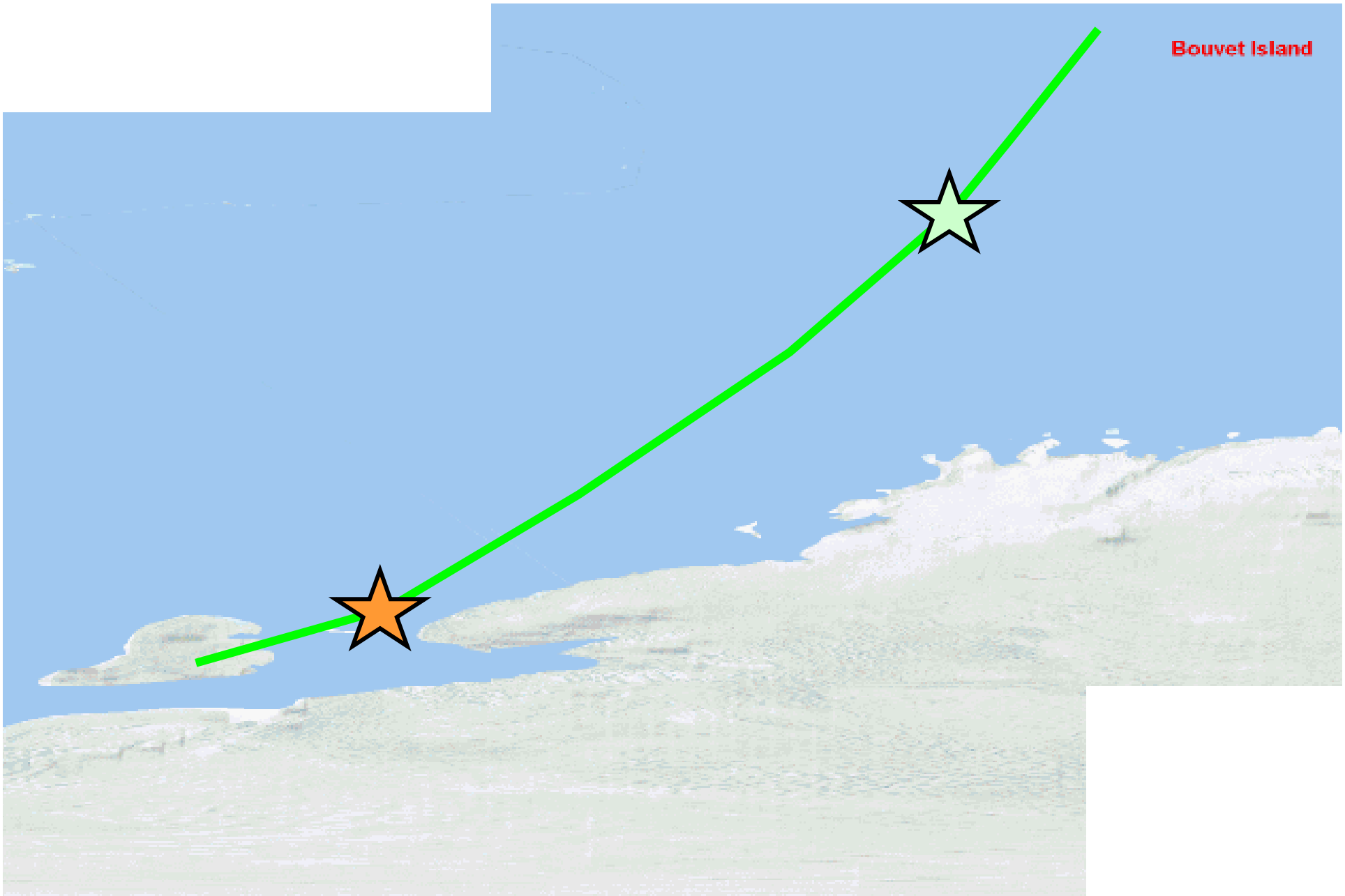
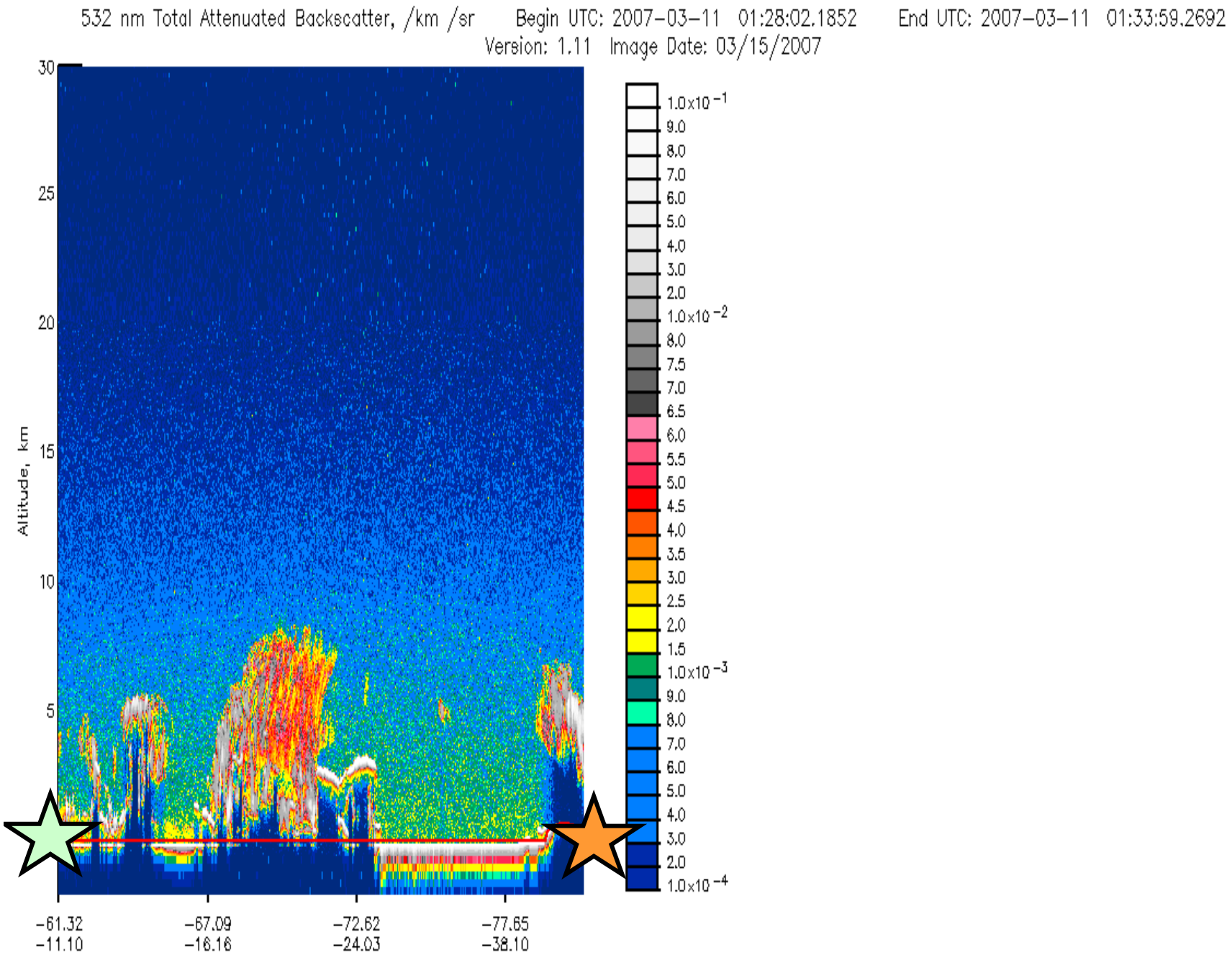
-90
-135
-90
-45
0
45
90
135


Bouvet Island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Altitude, km
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25
20
15
10
5
1.0x10 -1
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0x10 -2
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0x10 -3
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0x10 -4
-61.32
-11.10
-67.09
-16.16
-72.62
-24.03
-77.65
-38.10

Linking
data collected in scientific expeditions,
satellite data
and data collected in school

ASTAR 2007 is a contribution to the POLARCAT program in the framework of the International Polar Year (IPY) 2007/2008.

POLARCAT : Polar Study using Aircraft, Remote Sensing, Surface Measurements and Models, of Climate, Chemistry, Aerosols, and Transport.

The ASTAR 2007 field campaign will be conducted from March 26 until April 17, 2007. Two research aircraft, the DLR Falcon and the AWI Do-228 (Polar 2), will operate during this period from the airport of Longyearbyen (Svalbard) at 78° North.

19..23 March 2007

Falcon instrument integration in Oberpfaffenhofen.

26 March 2007

Ferry flight of the Falcon from Oberpfaffenhofen to Longyearbyen via Kiruna (with measurements).

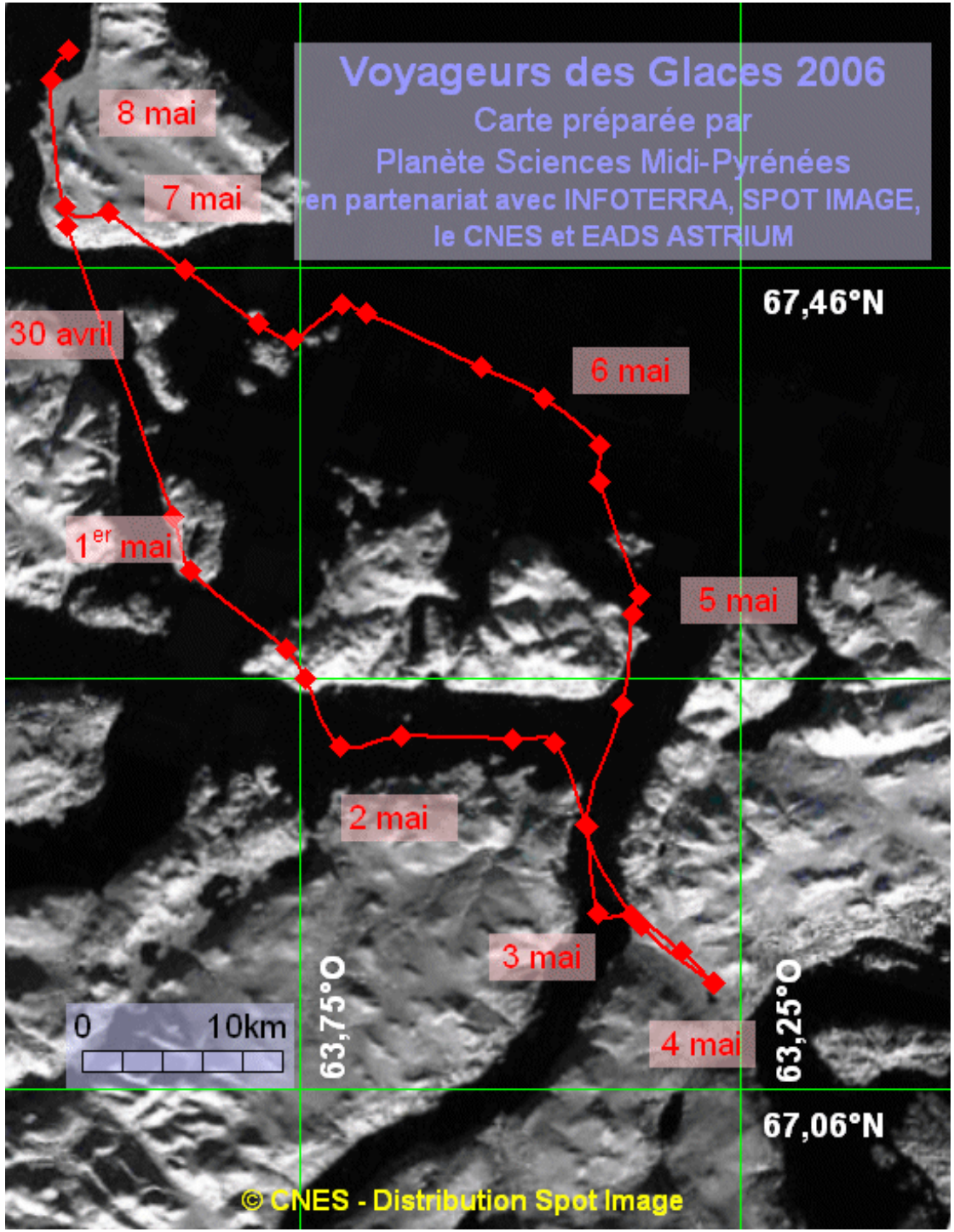
Start of instrument integration on Polar 2 (in Longyearbyen).

27 March..16 April 2007

Time window for science flights of Falcon and Polar 2 from Longyearbyen.


Voyageurs
des Sciences
glaces
2006

L'expédition…


Voyageurs des Glaces 2006
Carte préparée par
Planète Sciences Midi-Pyrénées
en partenariat avec INFOTERRA, SPOT IMAGE,
le CNES et EADS ASTRIUM
8 mai
7 mai
30 avril
6 mai
1er mai
5 mai
2 mai
3 mai
4 mai
67,46°N
67,06°N
63,75°O
63,25°O
0
10km
© CNES - Distribution Spot Image

Campagnes de mesure

Objectifs pédagogiques

Collaboration entre établissements scolaires et avec un site distant (expédition en Arctique)

Faire une comparaison entre des données sol et des données satellite

- entre l'Arctique et une région tempérée (le Sud Ouest de la France)

- à l'intérieur de la même zone géographique en France

en France

au Nunavut