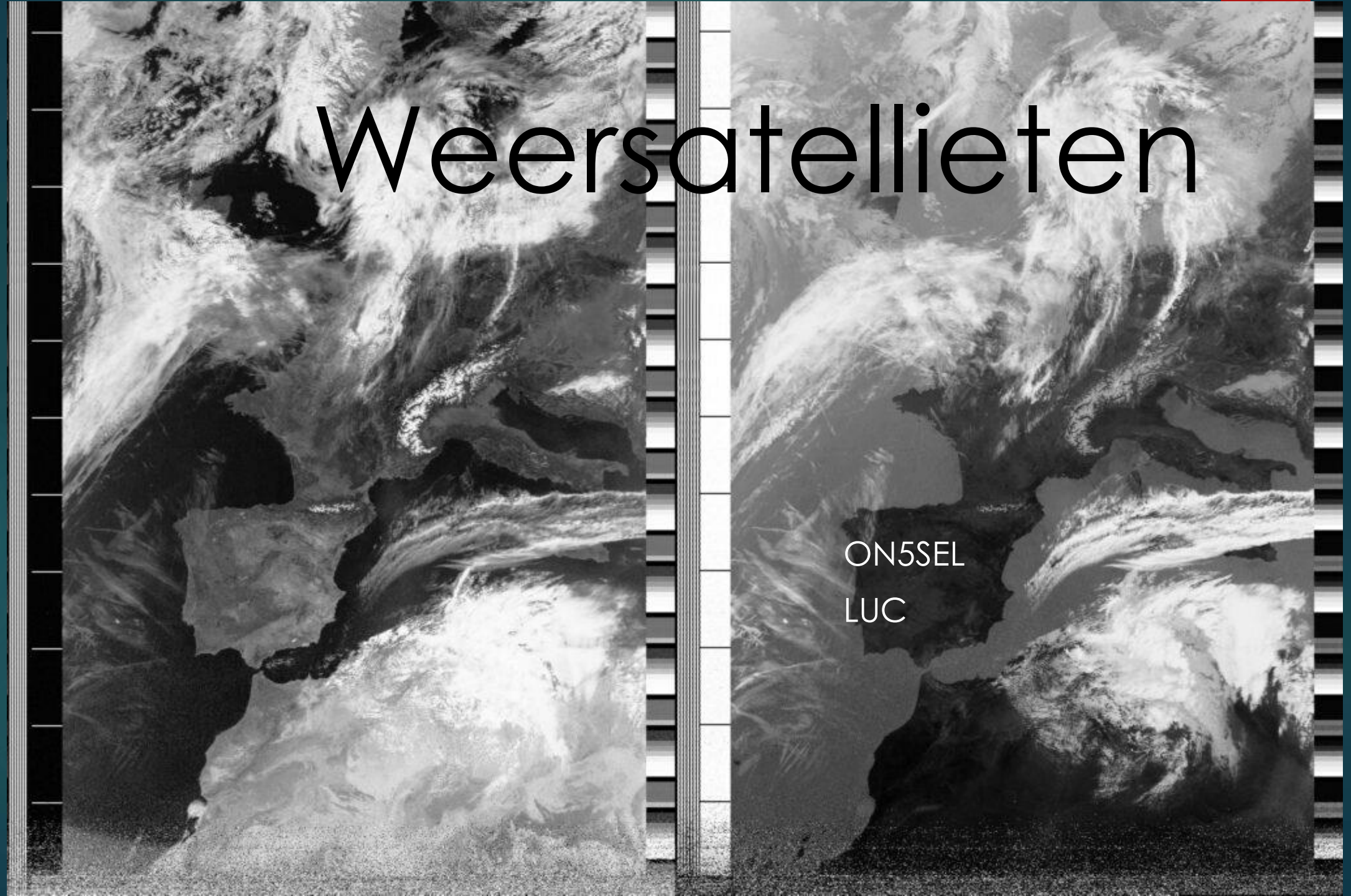
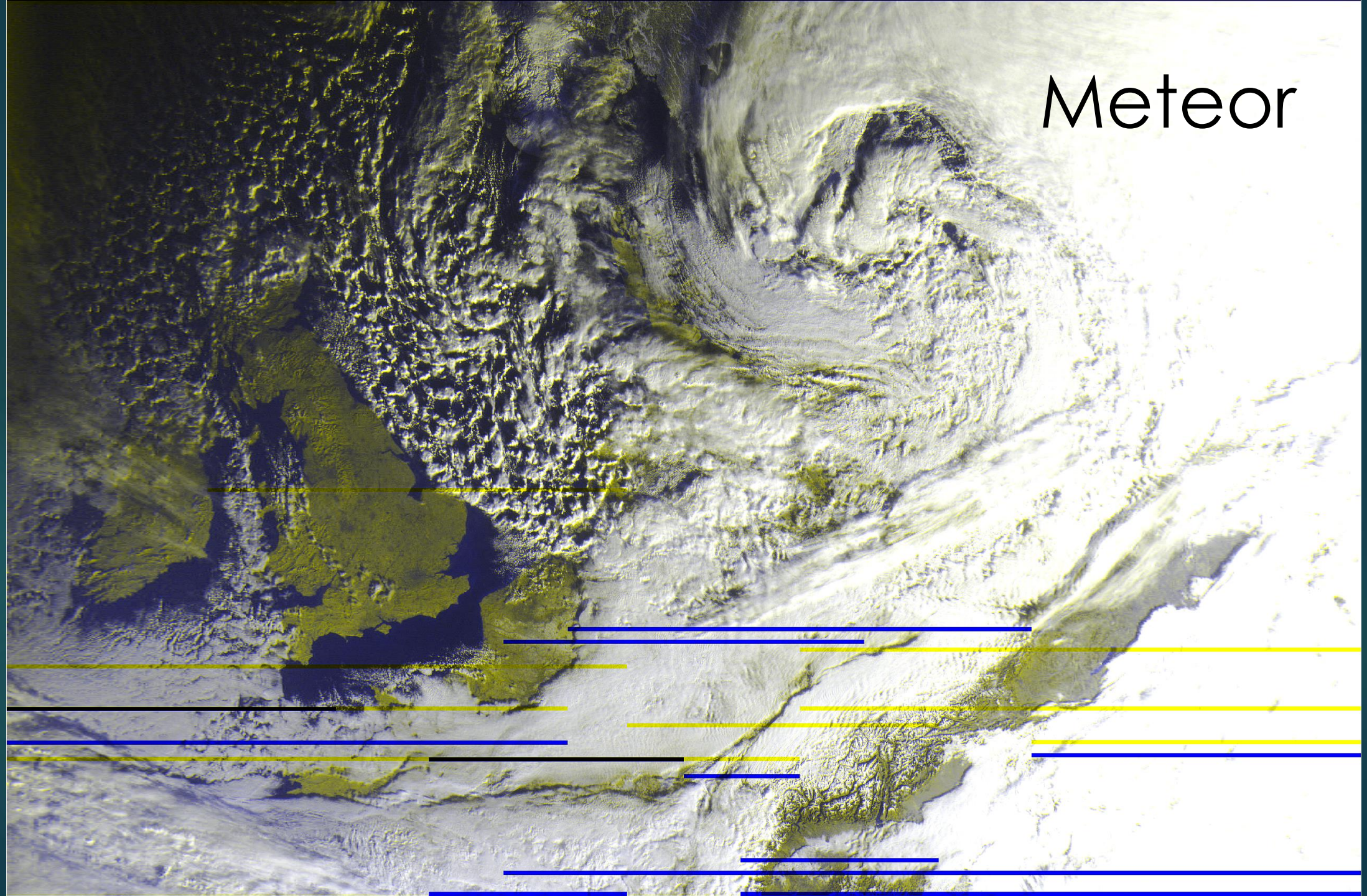
Weersatellieten



ON5SEL

LUC

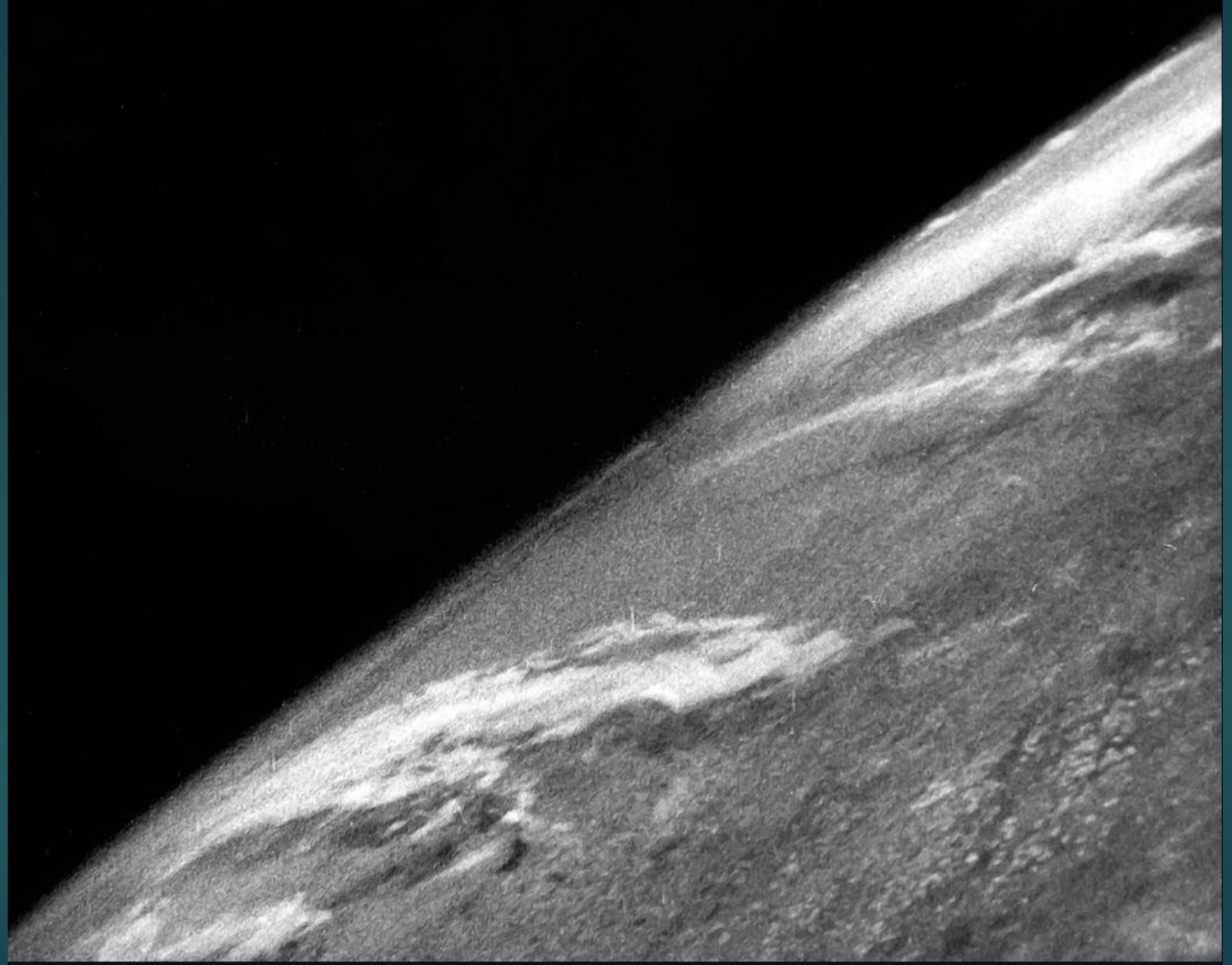

Meteor

WEERSATELLIETEN

- Geschiedenis
- Soorten weersatellieten
- Ontvanger
- Antennes
- Software

Geschiedenis

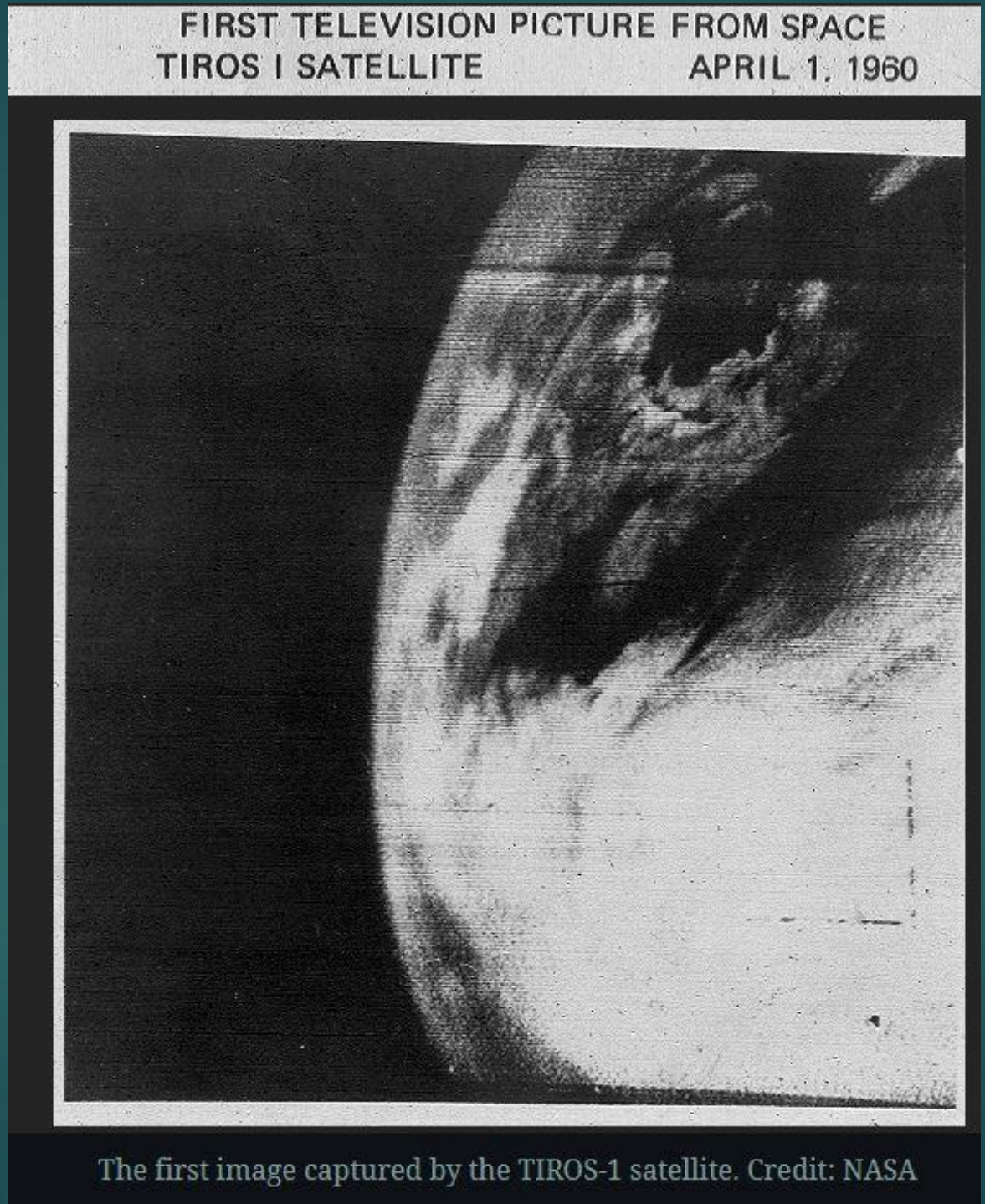
- Telegraaf
- Vliegtuigen, radiosondes, weerballon
- 1946: eerste foto uit de ruimte
- 1960: eerste weersatelliet, Tiros-1
- 1966: eerste geostationaire satelliet: ATS-1
- 1964-1978: Nimbus satellieten
- 1969: Nimbus-3, verticale scan van de aarde met temperatuur, vocht en waterdamp sensor
- Introductie Microwaves
- 1973: eerste “moving cloud formations”
- 1974-,,,,, SMS, NOAA’s GOES, Meteosat (1977)



First photo of the Earth from space, taken in 1946. Credit: White Sands Missile Range/Applied Physics Laboratory

Geschiedenis

- Telegraaf
- Vliegtuigen, radiosondes, weerballon
- 1946: eerste foto uit de ruimte
- 1960: eerste weersatelliet, Tiros-1
- 1966: eerste geostationaire satelliet: ATS-1 earth and moon 1966
- 1964-1978: Nimbus satellieten
- 1969: Nimbus-3, verticale scan van de aarde met temperatuur, vocht en waterdamp sensor
- Introductie Microwaves
- 1973: eerste “moving cloud formations”
- 1974-,,,,, SMS, NOAA’s GOES, Meteosat (1977)



The first image captured by the TIROS-1 satellite. Credit: NASA

Geschiedenis

- Telegraaf
- Vliegtuigen, radiosondes, weerballon
- 1946: eerste foto uit de ruimte
- 1960: eerste weersatelliet, Tiros-1 First picture from Tiros 1 1960.JPG
- 1966: eerste geostationaire satelliet: ATS-1
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- Introductie Microwaves
- 1973: eerste "moving cloud formations"
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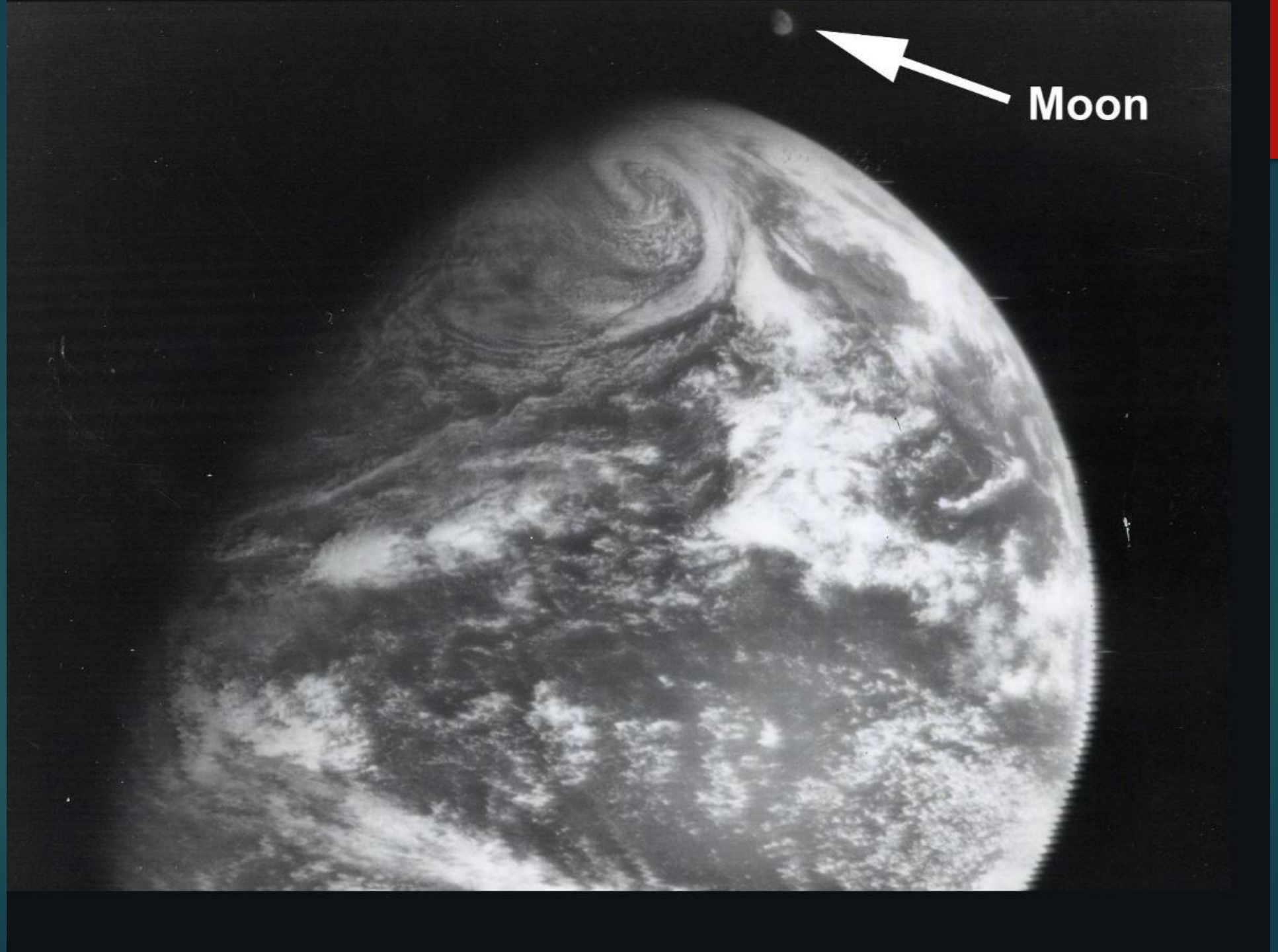

Moon

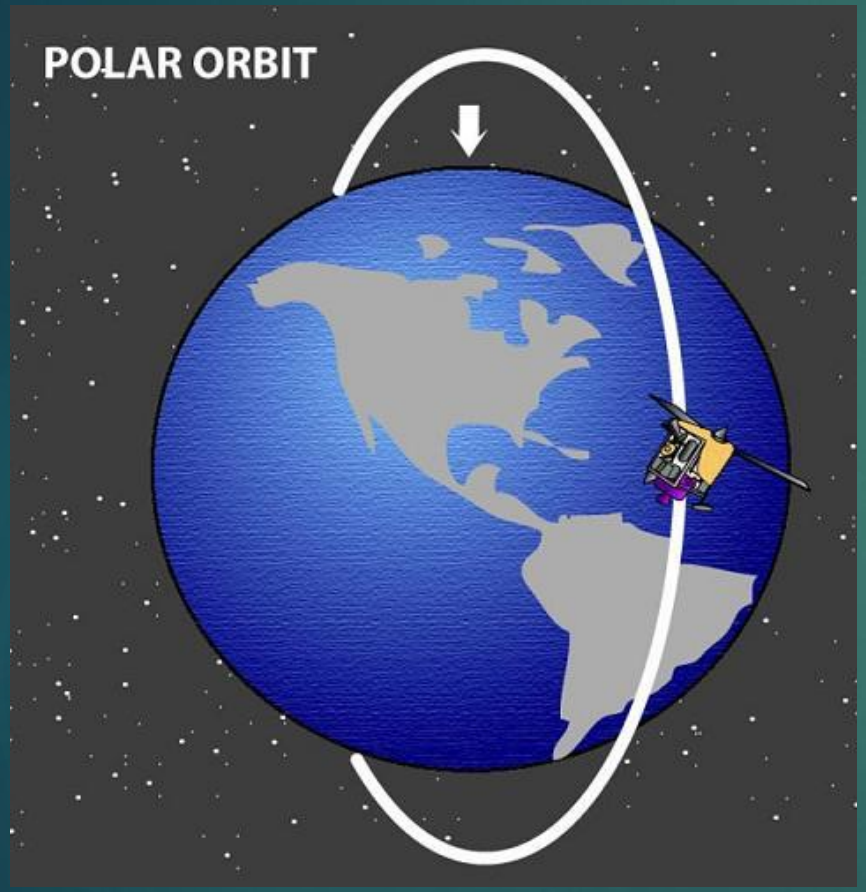
Geschiedenis

- Telegraaf
- Vliegtuigen, radiosondes, weerballon
- 1946: eerste foto uit de ruimte
- 1960: eerste weersatelliet, Tiros-1
- 1966: eerste geostationaire satelliet: ATS-1
- 1964-1978: Nimbus satellieten
- 1969: Nimbus-3, verticale scan van de aarde met temperatuur, vocht en waterdamp sensor
- Introductie Microwaves
- 1973: eerste “moving cloud formations”
- 1974-,,,,, SMS, NOAA’s GOES, Meteosat (1977)

Soorten weersatellieten

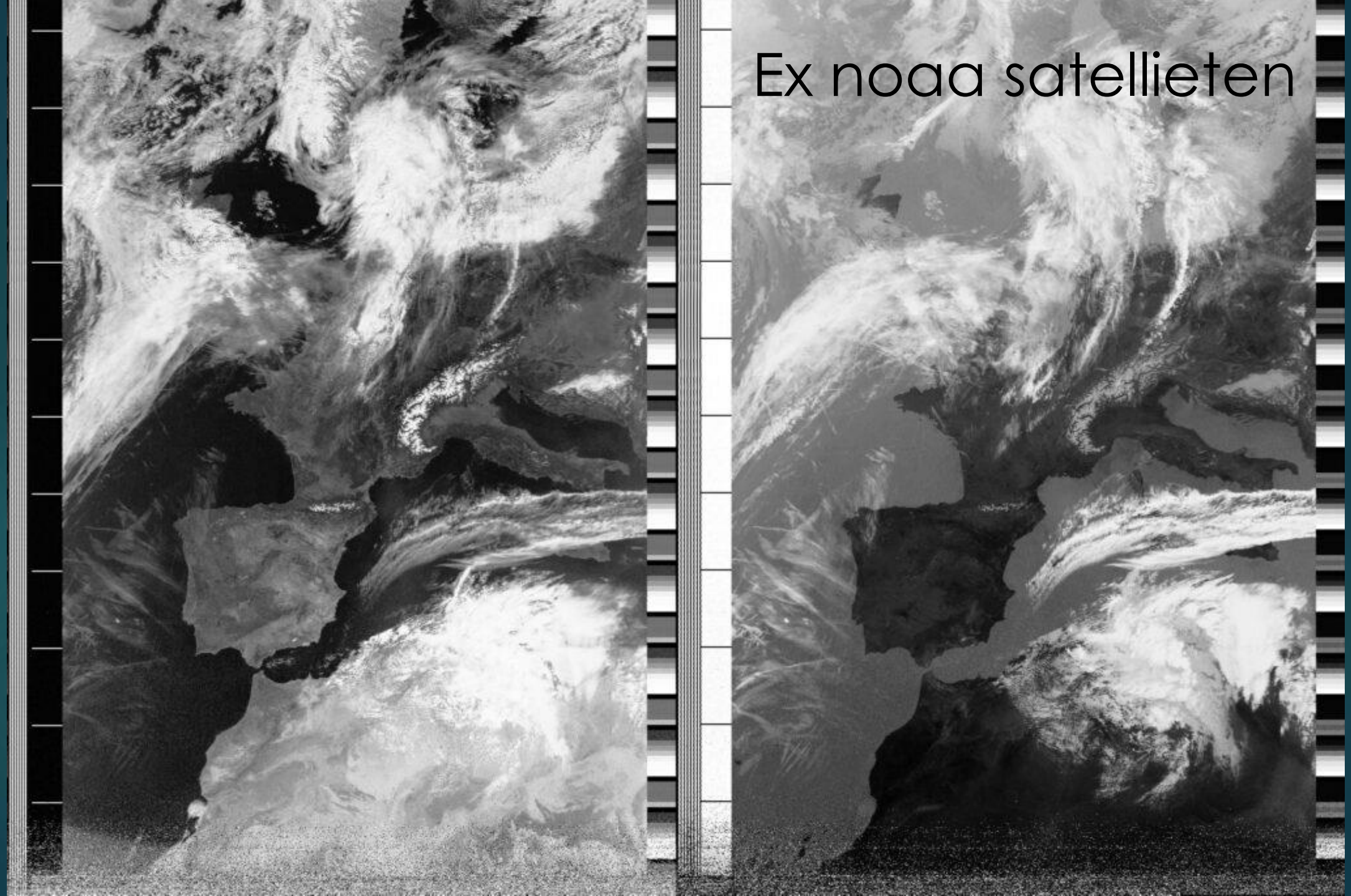
- Polair
- Geostationair

Polaire weersatellieten

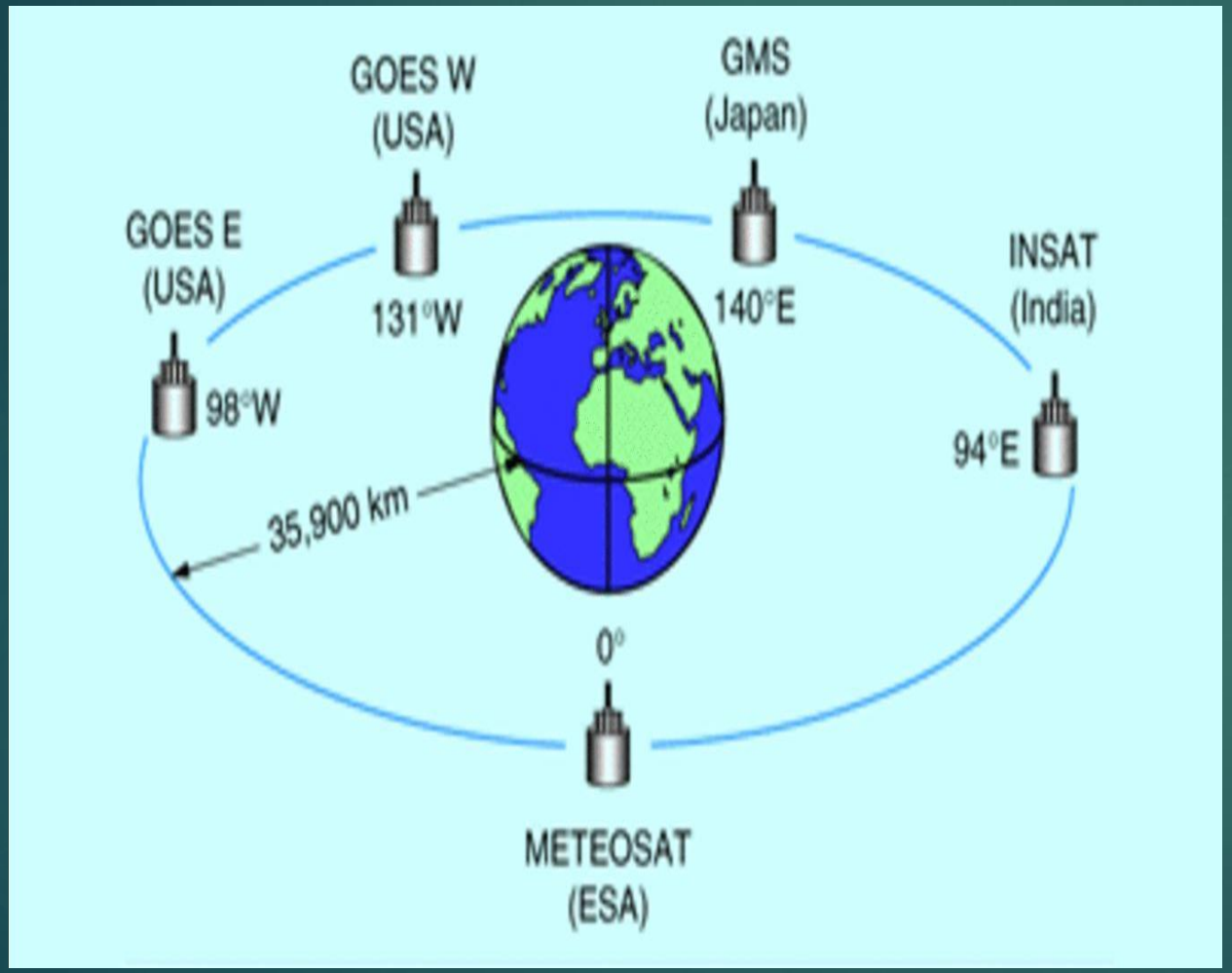


Meteor M2-3 en M2-4
+/- 800 km hoogte
1.5 u omloopsnelheid
+/- 27,000 km/u
137.100 - 137.900
HRPT 1,691 GHz

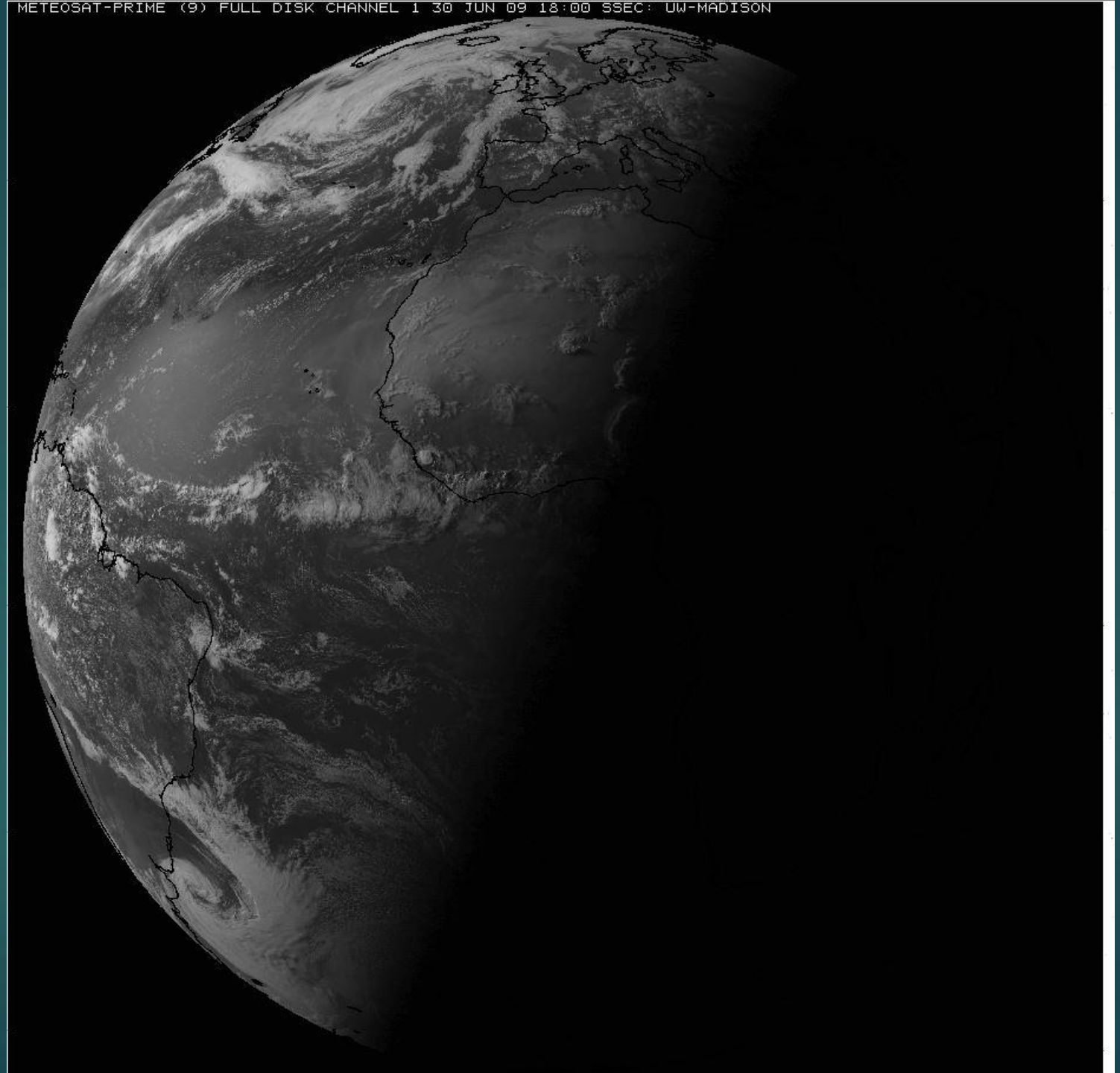
Ex noaa satellieten



Geostationaire weersatellieten



36,000 km hoogte
1 omwenteling van de aarde 24u
11,000 km/u


METEOSAT-PRIME (9) FULL DISK CHANNEL 1 30 JUN 09 18:00 SSEC: UW-MADISON

Wist je dat ……

Benodigdheden

- Ontvanger
- Antenne
- Software
- PC of laptop

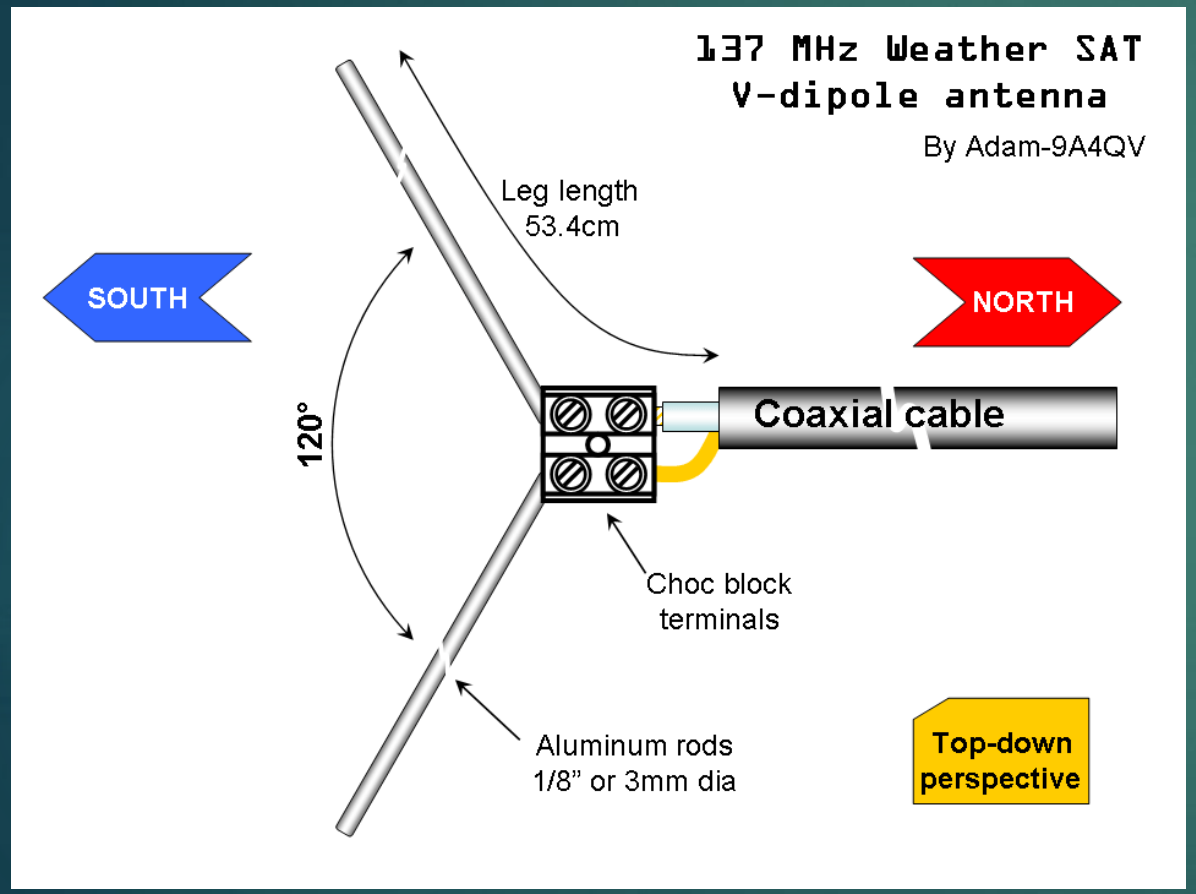
Ontvanger

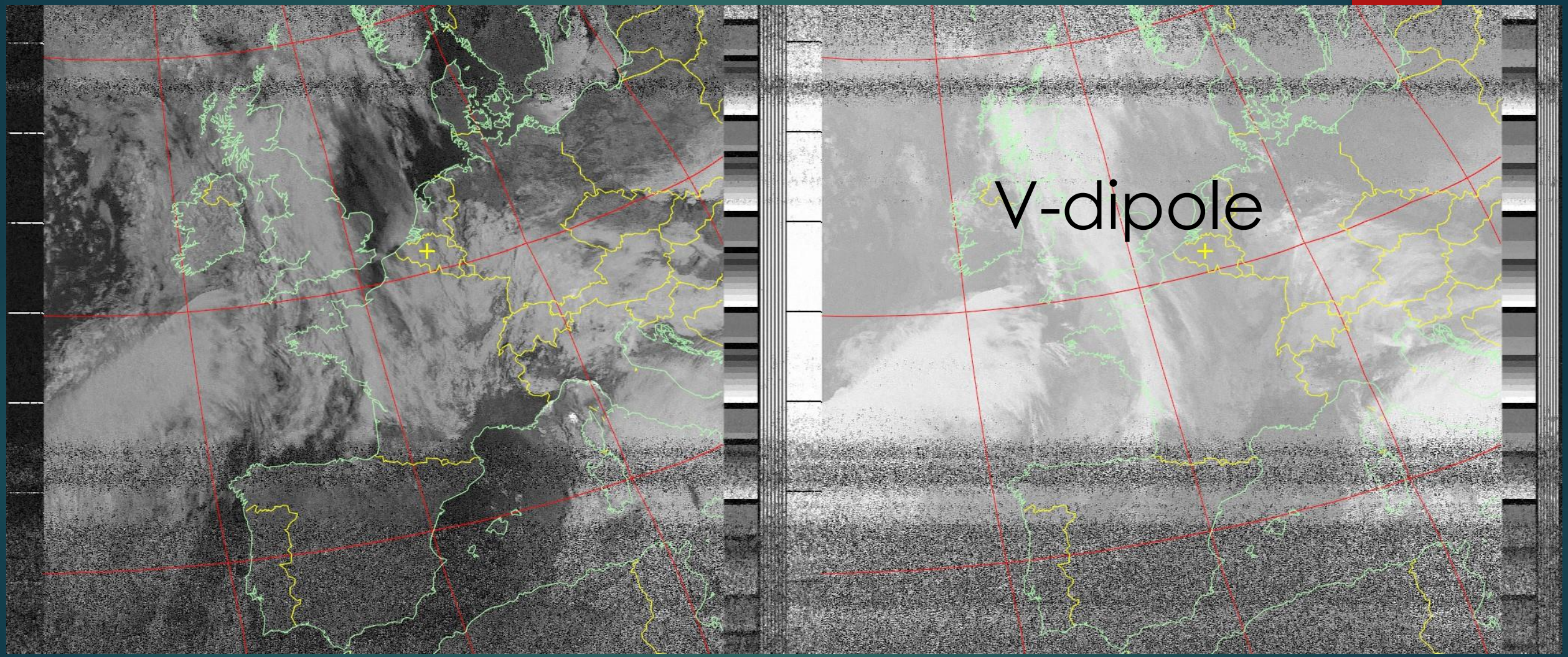
- 137 MHz
- SDR ontvanger (Software Defined Radio)
- Vanaf 35 euro

Antennes

- V-dipole
- Turnstyle
- Quadrifilar

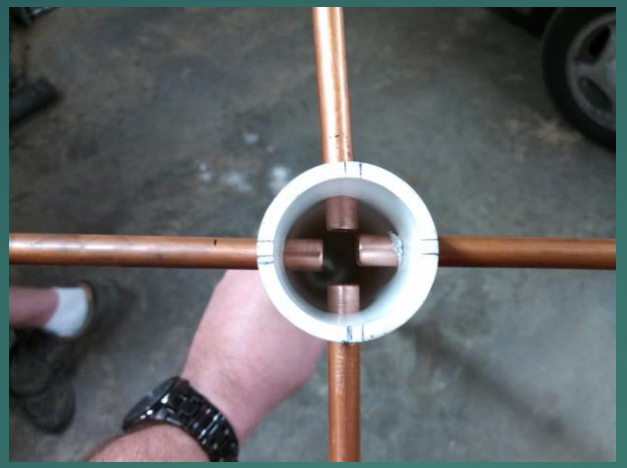
V-Dipole


137 MHz Weather SAT
V-dipole antenna
By Adam-9A4QV
Leg length
53.4cm
SOUTH
NORTH
120°
Coaxial cable
Choc block
terminals
Aluminum rods
1/8" or 3mm dia
Top-down
perspective


V-dipole

Turnstyle

Quadrifilar



https://usradioguy.com/wp-content/uploads/2020/05/20200307-How-To-Build-A-QFH.pdf

Discone

Software

- SDRAngel (was oa, voor NOAA's)
- WXtoImg (was voor NOAA's)
- SatDump
- MeteorGis

SDRAngel

- SDRangel www.sdrangel.org
- Open source, gratis, geen extra software nodig
- Ook voor andere toepassingen te gebruiken zoals:
  - Wide band receiver (0,5 – ,,,, MHz) all modes
  - DAB omroep
  - APRS
  - ADS-B
  - AIS (wat ADS-B voor de luchtvaart is, is AIS voor de scheepvaart)

File View Workspaces Preferences Help

W0 S AS

R:0 RTL-SDR[0]

3200k 1,090,000 kHz

LO ppm -17

Auto DC IQ Bias T Fp Cen X

L SR 3,200,000 S/s Dec 1

No-mod DS Ofs RFBW 2,500 kHz

Gain 49.6 AGC

R:0 RTL-SDR[0]

CF:1.090G SP:3.200M

0 -25 -50 -75 -100

1.0890 1.0900 1.0910

1090.000000

0 10 20 30 40 50 60 70 80 90 100

Angel

Han 1k 0 No 1

A 0 100 20

R:0:0 ADS-B Demodulator

Settings

Δf +0,000,000 Hz -28.2 dB

dB -95 -90 -85 -80 -75 -70 -65 -60 -55 -50 -45 -40 -35 -30 -25 -20 -15 -10 -5 0

BW 2.6M SR 6 M S FP Threshold 1.0

Device R0

ADS-B Data

	ICAO ID	Callsign	Aircraft	Airline	Country	GS (kn)	TAS (kn)	IAS (kn)	Mach	Sel Alt (ft)	Alt (ft)	VR (ft/m)	Sel Hd (°)	Hd (°)	TR (°/s)	Roll (°)	D (km)	Az/El (°)	Cat	Status	Squawk	Reg	Registered	
1	4074e3		787-8	BRITISH AIRWAYS		486				40000	40…	-64	293	290			78.4	295/9				G-ZBJK	2018-09…	Boe
2	407b70					439				28000	36…	0		290			49.0	295/13		No emergency	6603			
3	a658a1	GTI4705	747-4KZF	ATLAS AIR		507				30000	30…	0	288	292			27.6	259/19	Heavy	No emergency	4106	N508KZ		Boe
4	48c239	RYR1HA	737-8AS (W)	BUZZ		426				37000	37…	0	99	104			23.3	171/29	Large	No emergency	3447	SP-RSQ		
5	4d222e	RYR1…				300				9000	9000	0	250	252			14.5	158/11	Large					
6	c00022	ADS244	FALCON 2000EX…	Anderson Air Ltd		483				40000	40…	0		213			17.0	35/46	Small			C-FABH	2017-06…	Da:
7	448ed2										200						6.9	353/0						
8	484a91		EC135 P2+	Klpd Police Aviation Service		78					2500	1152		89			18.7	347/2				PH-PXA		Eur

TC-JJE

Manufacturer: Boeing
Aircraft: 777 3F2ER
Owner: Turkish Airlines
Operator: THY

1.090.000.000

SatDump

General Purpose Satellite Data Processor

9687 TLEs loaded!

All-in one
Alle weersatellieten

SatDump v1.2.1-9f3d51f

Offline processing | Recorder | Viewer | Settings | About

11.146 - + FFT Max

-70.427 - + FFT Min

23.819 - + Avg Num

Classic [Youssef Touil] Palette

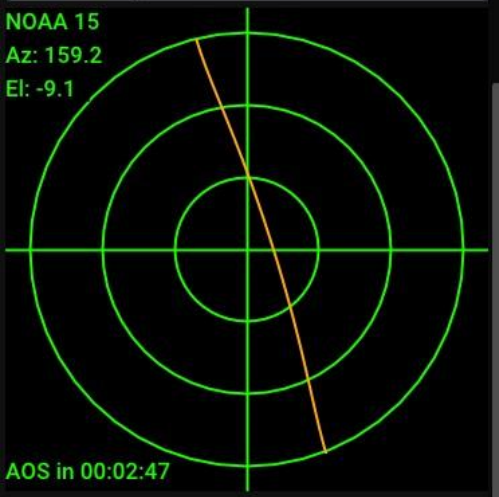
Show Waterfall

Frequency Scale

Processing

Recording

Tracking



Satellites Horizons

NOAA 15

Object Information

Rotator Configuration

Autotrack Engaged: NO

Schedule and Config

VFOs

Debug

11 dB

2 dB

- 418.637 kHz
99.5814 MHz

-5 dB

-13 dB

-21 dB

-29 dB

-37 dB

-45 dB

-54 dB

-62 dB

Info 10360 TLEs loaded!

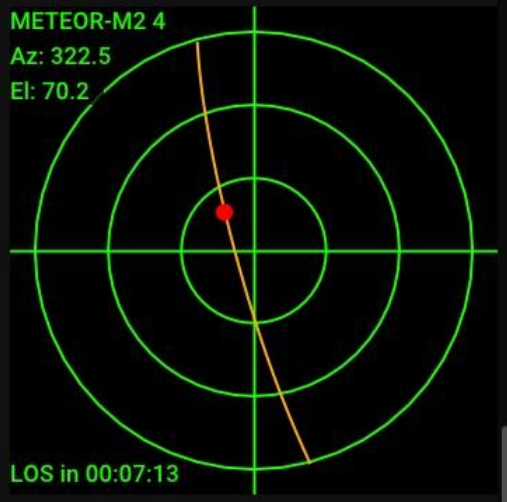
SatDump v1.2.1-9f3d51f

Offline processing | Recorder | Viewer | Settings | About

▶ Recording

▼ Tracking

METEOR-M2 4
Az: 322.5
El: 70.2



LOS in 00:07:13

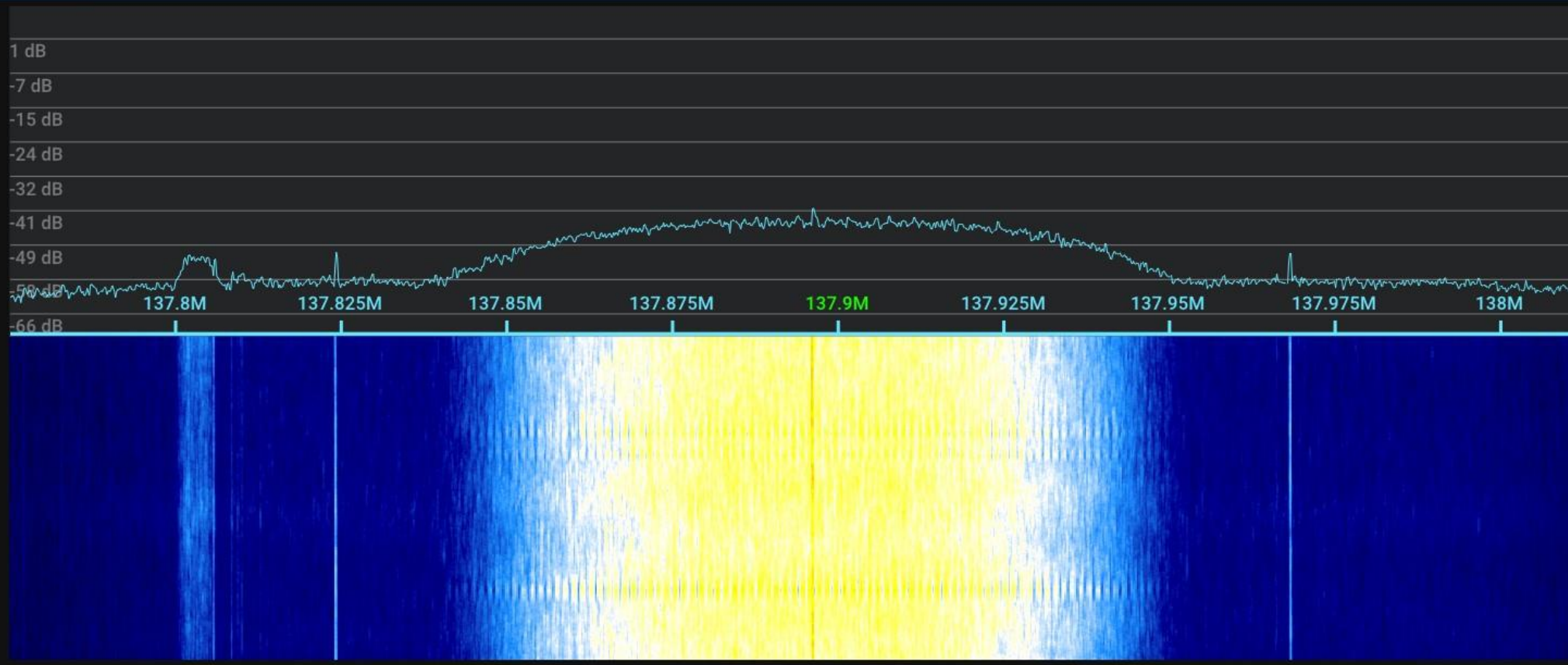
Satellites Horizons

METEOR-M2 4

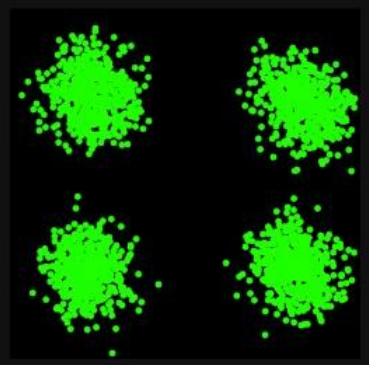
▶ Object Information

▶ Rotator Configuration

Autotrack Engaged: NO



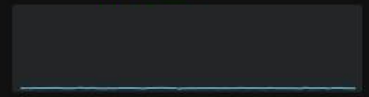
OQPSK Demodulator



Signal
Freq : -3.8992 kHz
SNR (dB) : 12.487
Peak SNR (dB) : 14.312
Avg SNR (dB) : 12.539

CCSDS r=1/2 Concatenated Decoder

Viterbi
State : SYNCED
BER : 0.004883



Deframer
State : SYNCED

Reed-Solomon
RS : 0 1 2 3

Info | Progress -nan(ind)%, Viterbi : SYNCED BER : 0.006104, Deframer : SYNCED

SatDump v1.2.1-9f3d51f

Offline processing | Recorder | Viewer | Settings | About

Products Processor

[13:56:19 - 24/09/2025] (I) C:\Users\seger\Documents\SatDump\live_output/2025-09-24_13-49_meteor_m2-x_lrpt_137.9 MHz/MSU-MR/product.cbor
[13:56:19 - 24/09/2025] (I) Loading MSU-MR-1.jpg
[13:56:19 - 24/09/2025] (I) Loading MSU-MR-2.jpg
[13:56:19 - 24/09/2025] (I) Loading MSU-MR-4.jpg
[13:56:19 - 24/09/2025] (D) Composite needs channel ch1
[13:56:19 - 24/09/2025] (D) Composite needs channel ch2
[13:56:19 - 24/09/2025] (T) Max Total Width 1568
[13:56:19 - 24/09/2025] (T) Max Total Used 1568
[13:56:19 - 24/09/2025] (T) Offset for ch1 is 0
[13:56:19 - 24/09/2025] (T) Offset for ch2 is 0
[13:56:20 - 24/09/2025] (I) Saving C:\Users\seger\Documents\SatDump\live_output/2025-09-24_13-49_meteor_m2-x_lrpt_137.9 MHz/MSU-MR/msu_mr_rgb_AVHRR_221_False_Color.jpg...
[13:56:20 - 24/09/2025] (I) Saving C:\Users\seger\Documents\SatDump\live_output/2025-09-24_13-49_meteor_m2-x_lrpt_137.9 MHz/MSU-MR/msu_mr_rgb_AVHRR_221_False_Color_corrected.jpg...
[13:56:21 - 24/09/2025] (D) Skipping AVHRR 3a21 False Color as it can't be made!
[13:56:21 - 24/09/2025] (D) Composite needs channel ch1
[13:56:21 - 24/09/2025] (D) Composite needs channel ch2
[13:56:21 - 24/09/2025] (D) Composite needs channel ch4
[13:56:21 - 24/09/2025] (T) Max Total Width 1568
[13:56:21 - 24/09/2025] (T) Max Total Used 1568
[13:56:21 - 24/09/2025] (T) Offset for ch1 is 0
[13:56:21 - 24/09/2025] (T) Offset for ch2 is 0
[13:56:21 - 24/09/2025] (T) Offset for ch4 is 0
[13:56:22 - 24/09/2025] (I) Saving C:\Users\seger\Documents\SatDump\live_output/2025-09-24_13-49_meteor_m2-x_lrpt_137.9 MHz/MSU-MR/msu_mr_rgb_MSU-MR_124_False_Color.jpg...
[13:56:22 - 24/09/2025] (I) Saving C:\Users\seger\Documents\SatDump\live_output/2025-09-24_13-49_meteor_m2-x_lrpt_137.9 MHz/MSU-MR/msu_mr_rgb_MSU-MR_124_False_Color_corrected.jpg...
[13:56:23 - 24/09/2025] (D) Skipping AVHRR 124 False Color as it can't be made!
[13:56:23 - 24/09/2025] (D) Skipping Natural Color as it can't be made!
[13:56:23 - 24/09/2025] (D) Skipping 10.8µm Thermal IR (Uncalibrated) as it can't be made!
[13:56:23 - 24/09/2025] (D) Skipping Day Microphysics as it can't be made!
[13:56:23 - 24/09/2025] (D) Skipping Night Microphysics as it can't be made!
[13:56:23 - 24/09/2025] (D) Skipping AVHRR 543b IR False Color as it can't be made!
[13:56:23 - 24/09/2025] (D) Skipping AVHRR 3b45 IR False Color as it can't be made!
[13:56:23 - 24/09/2025] (D) Skipping NO enhancement as it can't be made!
[13:56:23 - 24/09/2025] (D) Skipping Cloud Top IR as it can't be made!
[13:56:23 - 24/09/2025] (D) Composite needs channel ch4
[13:56:23 - 24/09/2025] (T) Max Total Width 1568
[13:56:23 - 24/09/2025] (T) Max Total Used 1568
[13:56:23 - 24/09/2025] (T) Offset for ch4 is 0
[13:56:26 - 24/09/2025] (D) Filtering timestamps...

SatDump v1.2.1-9f3d51f

Offline processing | Recorder | Viewer | Settings | About

Products | Projections

▼ General

METEOR-M2-4 2025/09/24 13:52:44

└ MSU-MR

Load Dataset/Products :

Open | Load

▼ Image

Composite

- [ ] Median Blur
- [ ] Despeckle
- [x] Rotate
- [x] Correct
- [ ] Equalize
- [ ] Individual Equalize
- [x] White Balance
- [ ] Normalize
- [ ] Invert
- [ ] Apply LUT
- [ ] Manual Brightness/Constrast

Save

▼ RGB Composites

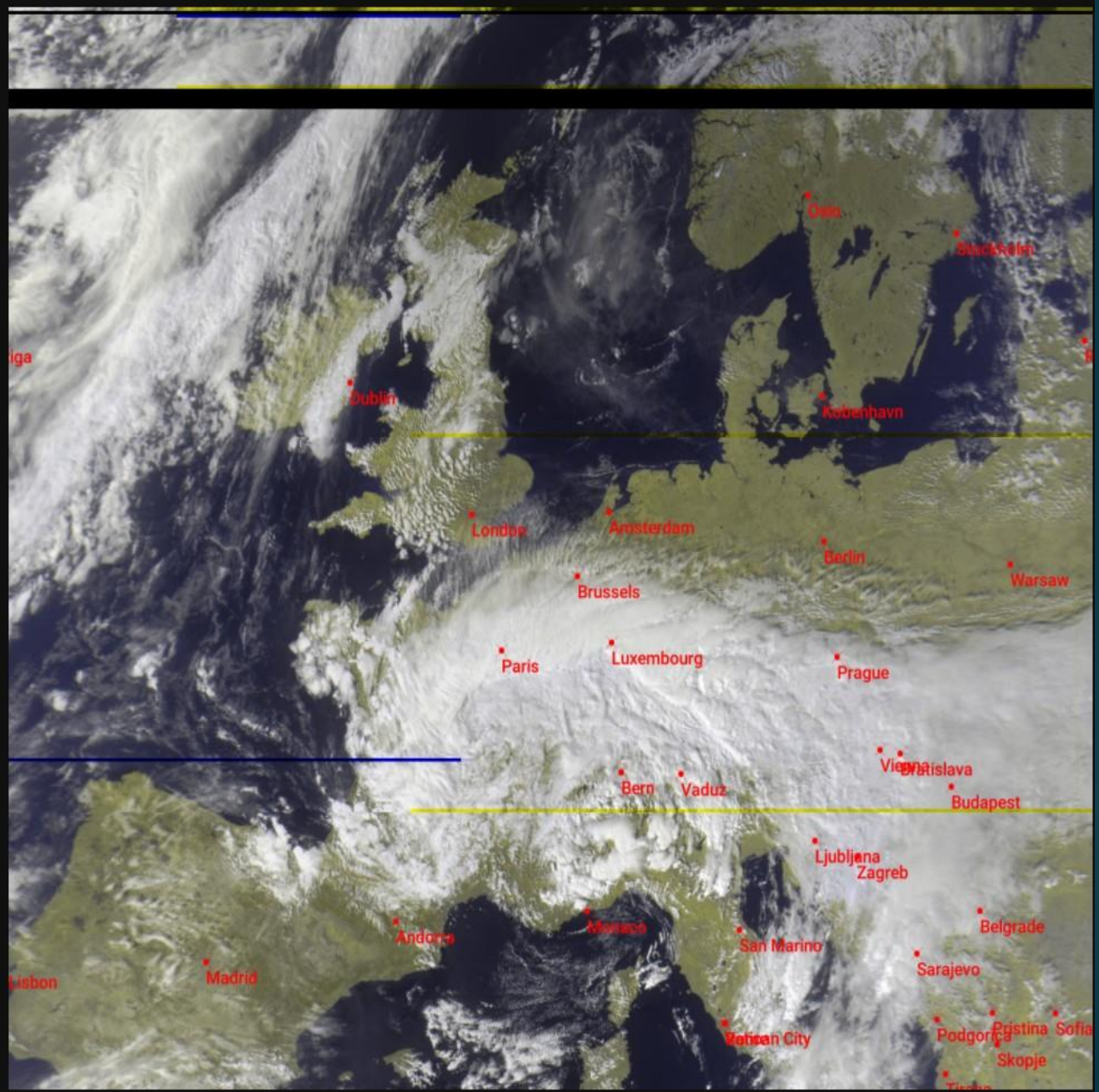
AVHRR 221 False Color | Info

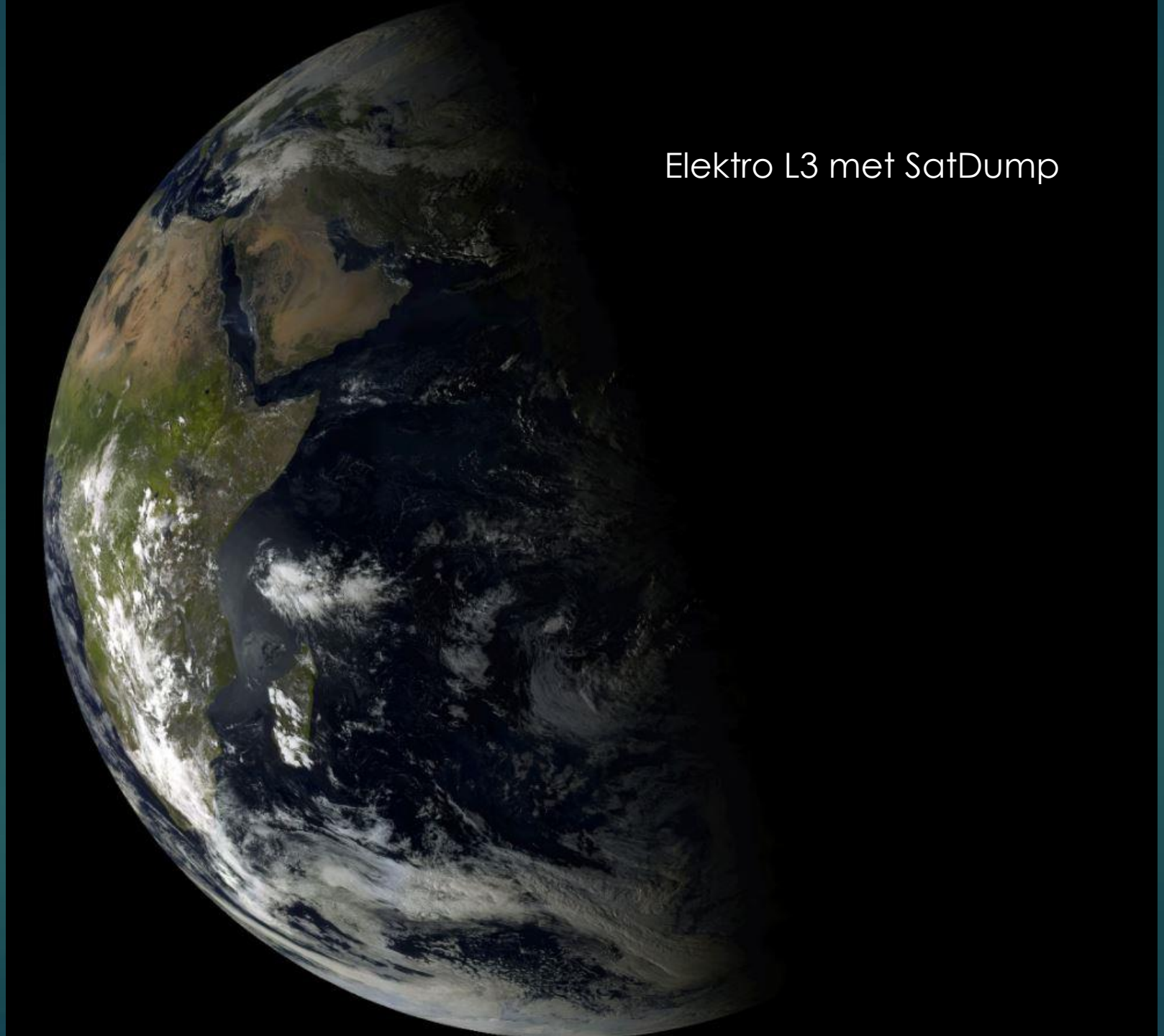
ch2, ch2, ch1

Apply 100%

▼ Map Overlay

- [ ] Lat/Lon Grid
- [ ] Map Overlay
- [ ] Shores Overlay
- [x] Cities Overlay
- [ ] OTH Overlay

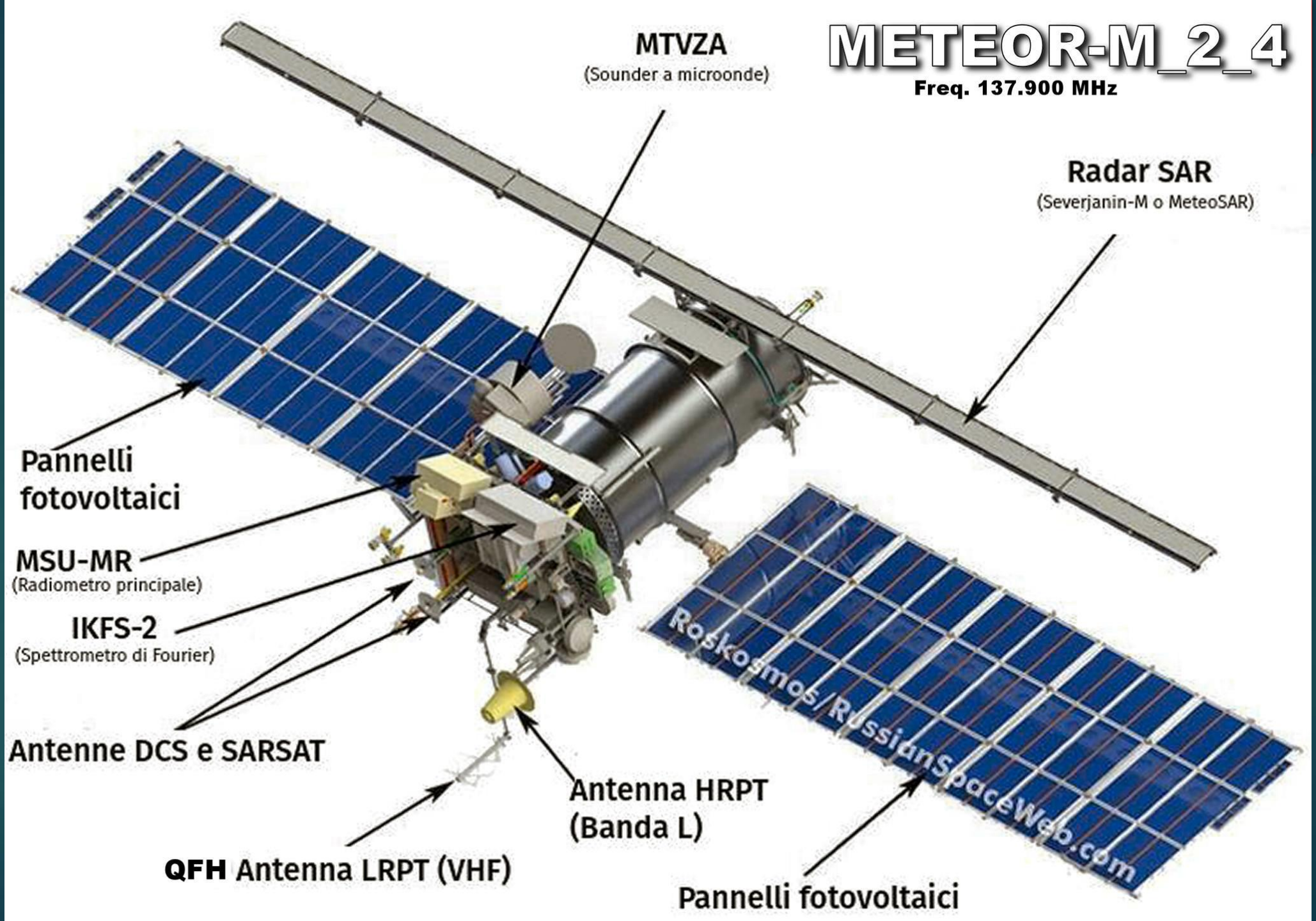




Elektro L3 met SatDump

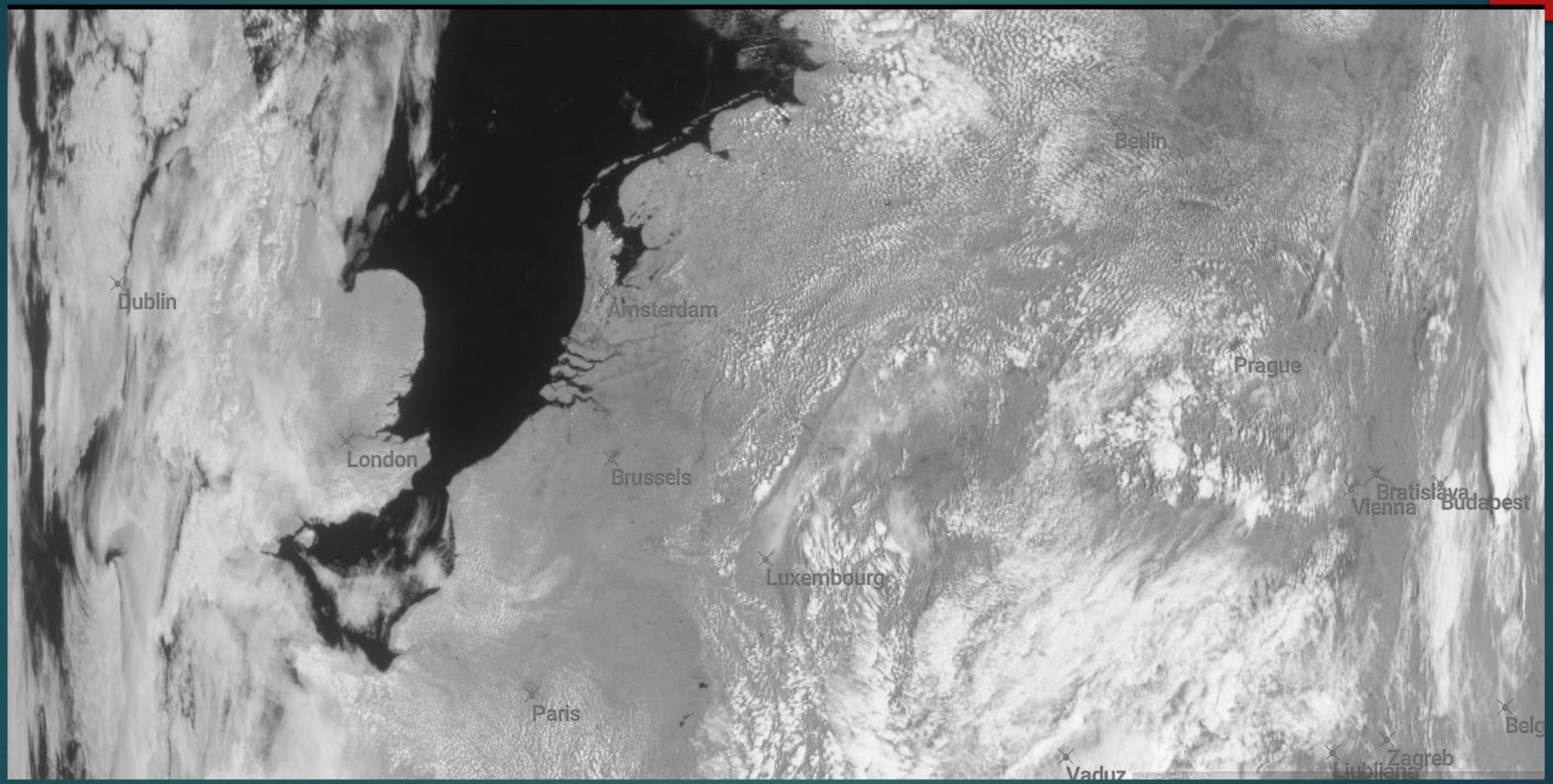
Meteor sats

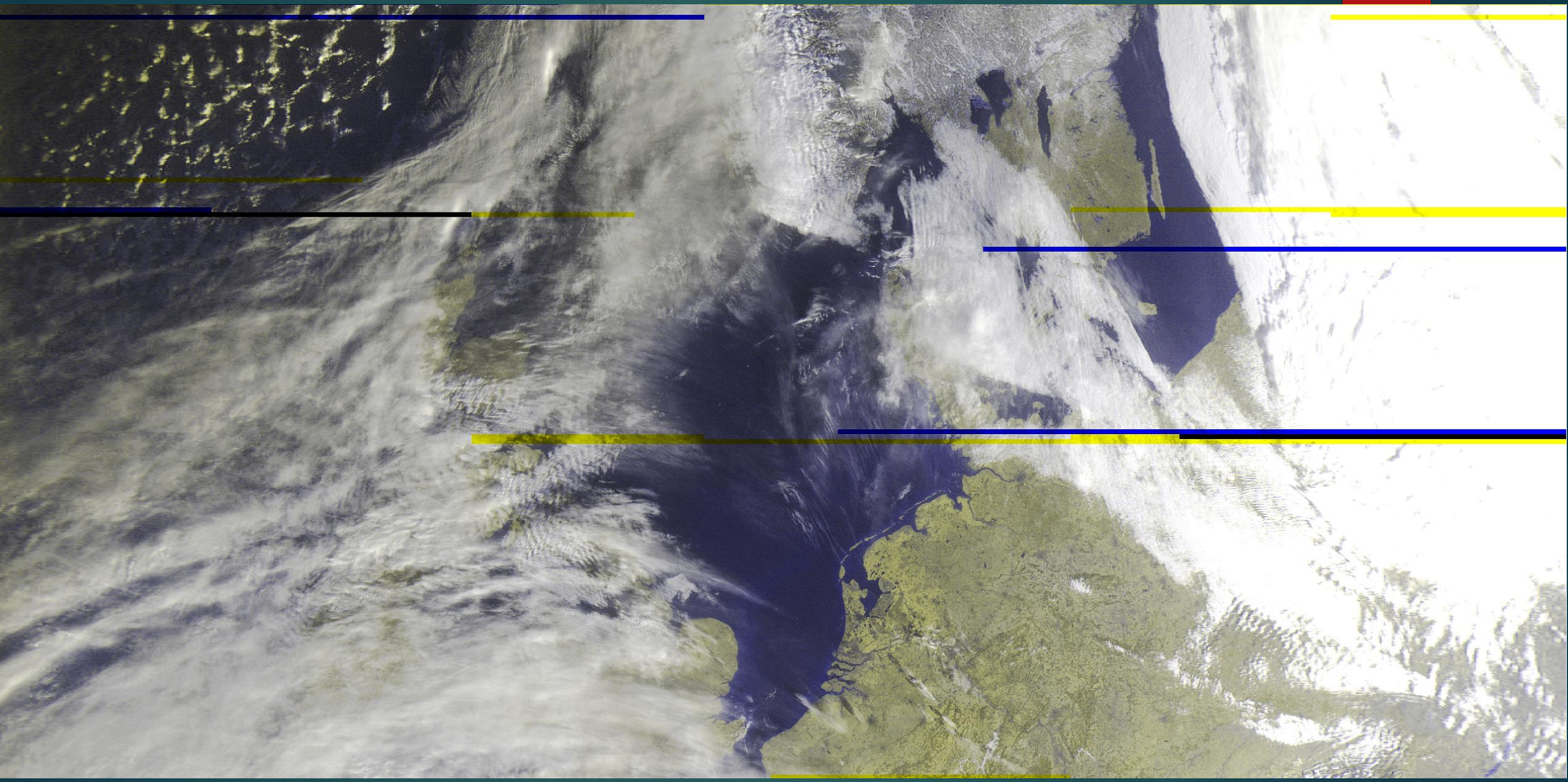
- Meteor M2-3
- Meteor M2-4

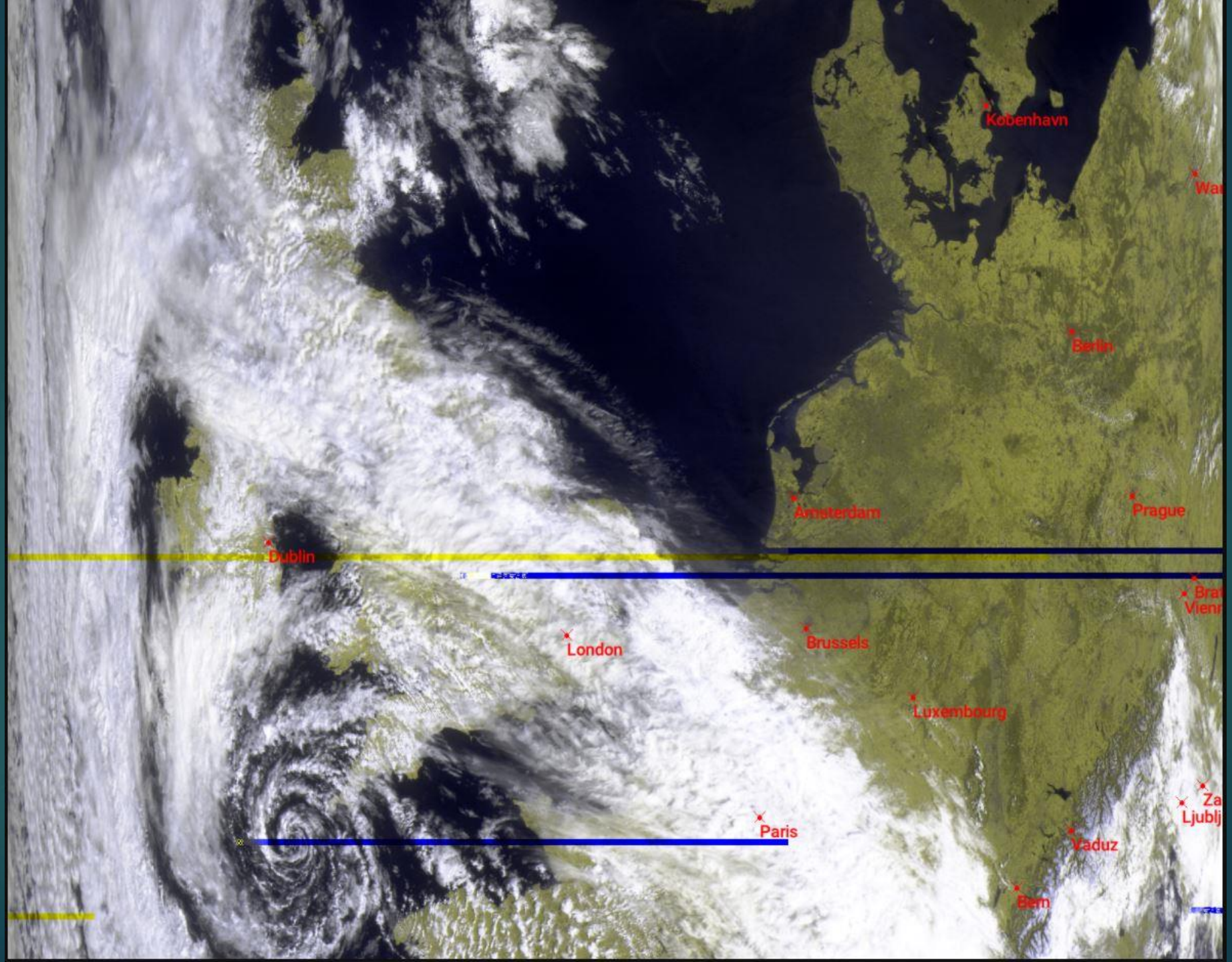

METEOR-M_2_4
Freq. 137.900 MHz
MTVZA
(Sounder a microonde)
Radar SAR
(Severjanin-M o MeteoSAR)
Pannelli
fotovoltaici
MSU-MR
(Radiometro principale)
IKFS-2
(Spettrometro di Fourier)
Antenne DCS e SARSAT
QFH Antenna LRPT (VHF)
Antenna HRPT
(Banda L)
Pannelli fotovoltaici
Roskosmos/RussianSpaceWeb.com

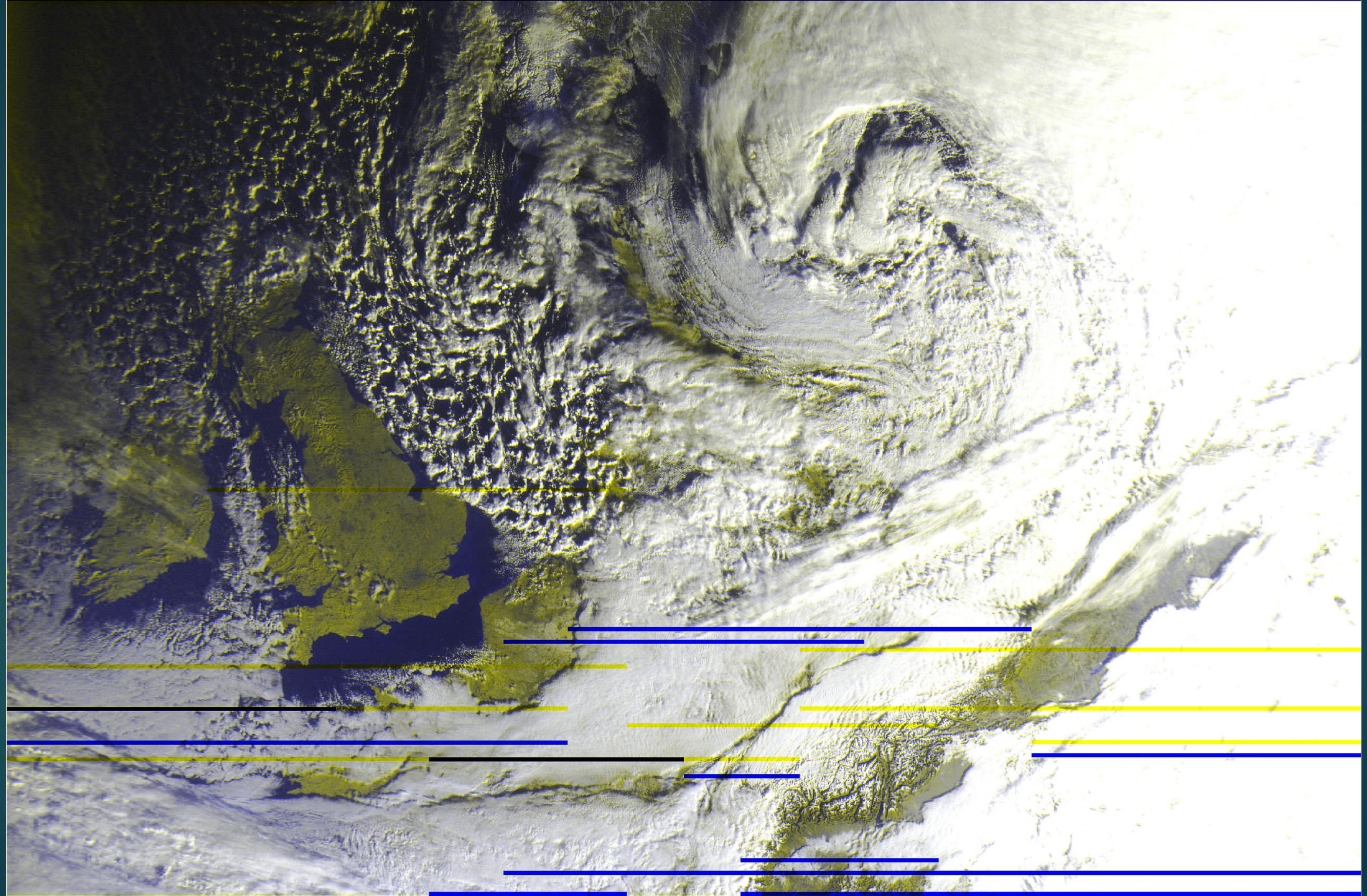
Meteor software

- MeteorGis (Les Hamilton)
  - SDR Sharp
  - LRPT decoder
  - MeteorGIS
  - Smooth Meteor


Dublin
Amsterdam
Berlin
Prague
London
Brussels
Bratislava
Vienna
Budapest
Luxembourg
Paris
Zagreb
Vaduz




Kobenhavn
Berlin
Amsterdam
Prague
Dublin
London
Brussels
Luxembourg
Paris
Vaduz
Bern




ON5SEL
LUC
Vragen