

**VEGA
LAUNCH VEHICLE
&
QUALIFICATION (*LARES*)
MISSION
CHARACTERISTICS**

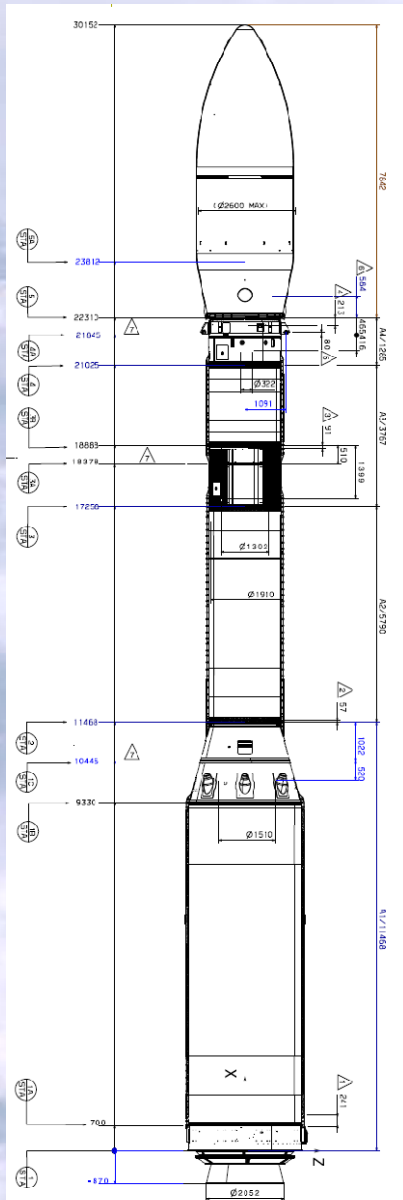


- Vega is a four stage vehicle mainly based on solid propulsion, with a high level of integration within the Ariane LV family

Design drivers are:

- P/L & customer comfort
- Launch Cost
- Mission flexibility
- Reliability



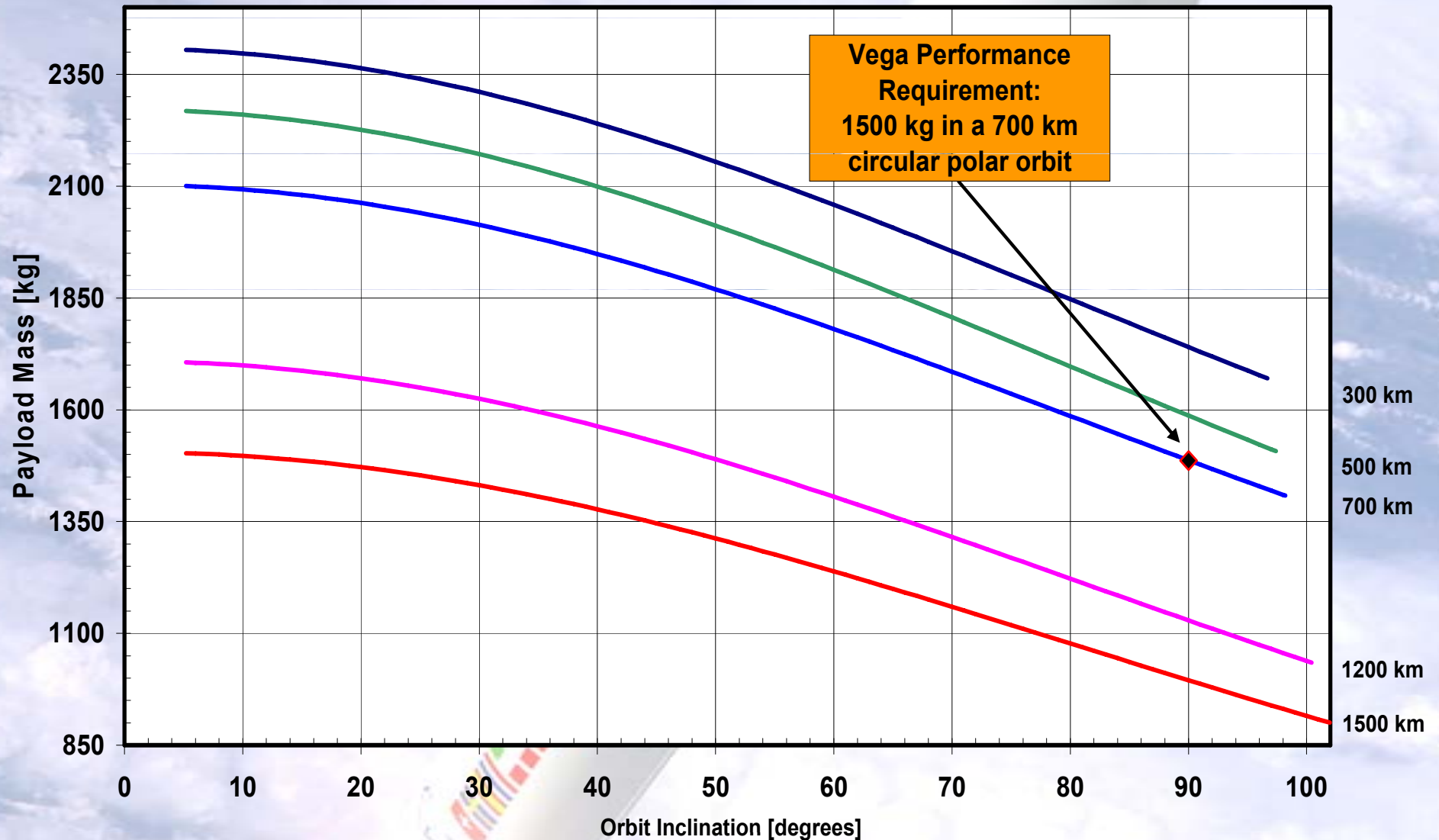


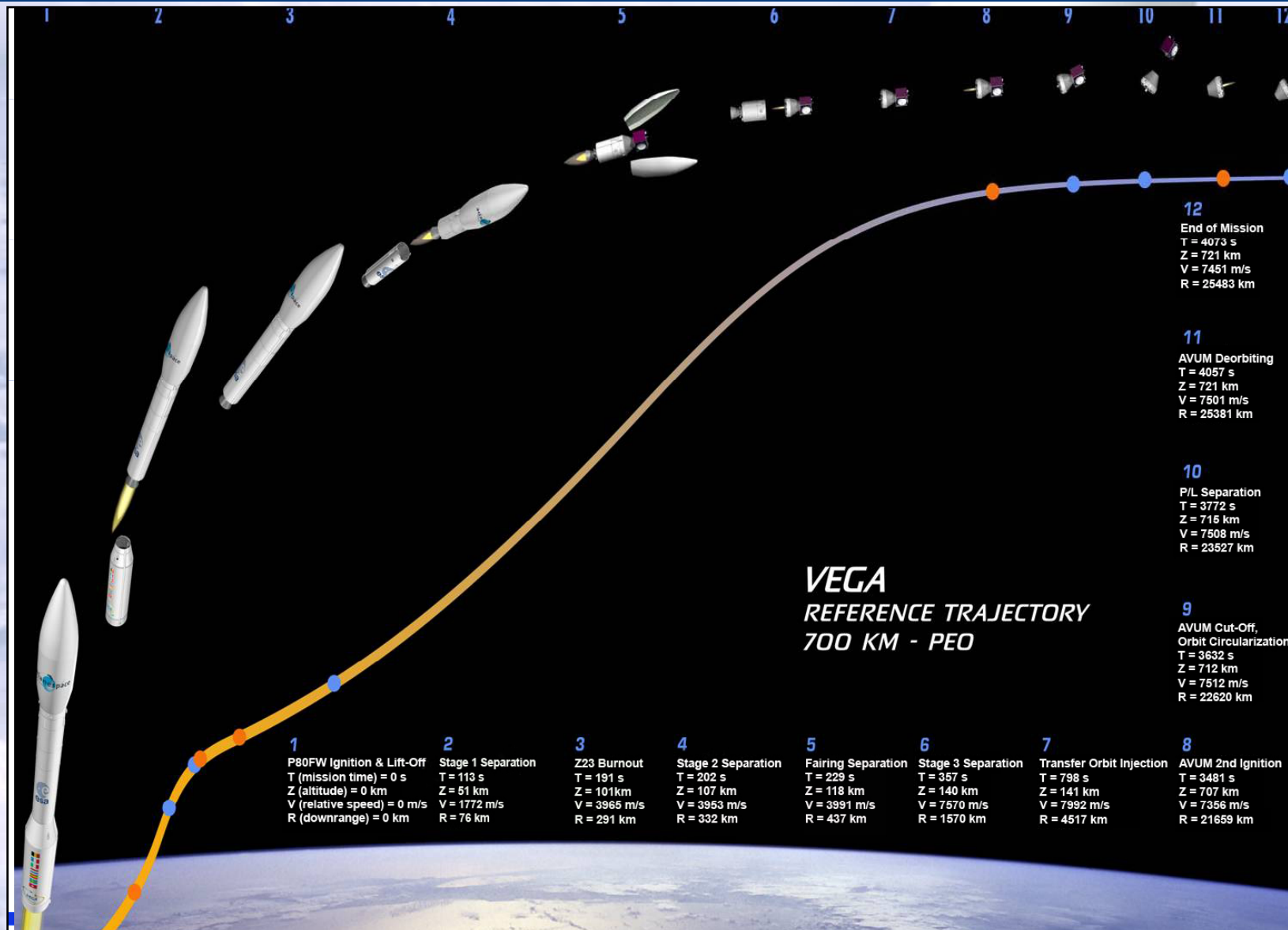
- The Vega LV is designed for a range of missions covering the injection of one payload into circular Low Earth Orbits (LEO), with altitudes ranging from 300 km to 1500 km and with inclinations ranging from nearly equatorial (5.2°) up to Sun Synchronous Orbits
- The injected Payload masses range is required from a minimum of 300 Kg up to a maximum of 2500 Kg, as appropriate according to orbit altitude and inclination.
- The Vega LV is designed to be compatible, in the above mentioned range of orbits, with the capability for multiple payloads delivery, defined as follows :
 - *Injection of two payloads, in the mass range of 300 – 1000 Kg;*
 - *Injection of one main payload and up to six micro-satellites, in a piggyback configuration, with mass of the order of 100 kg.*

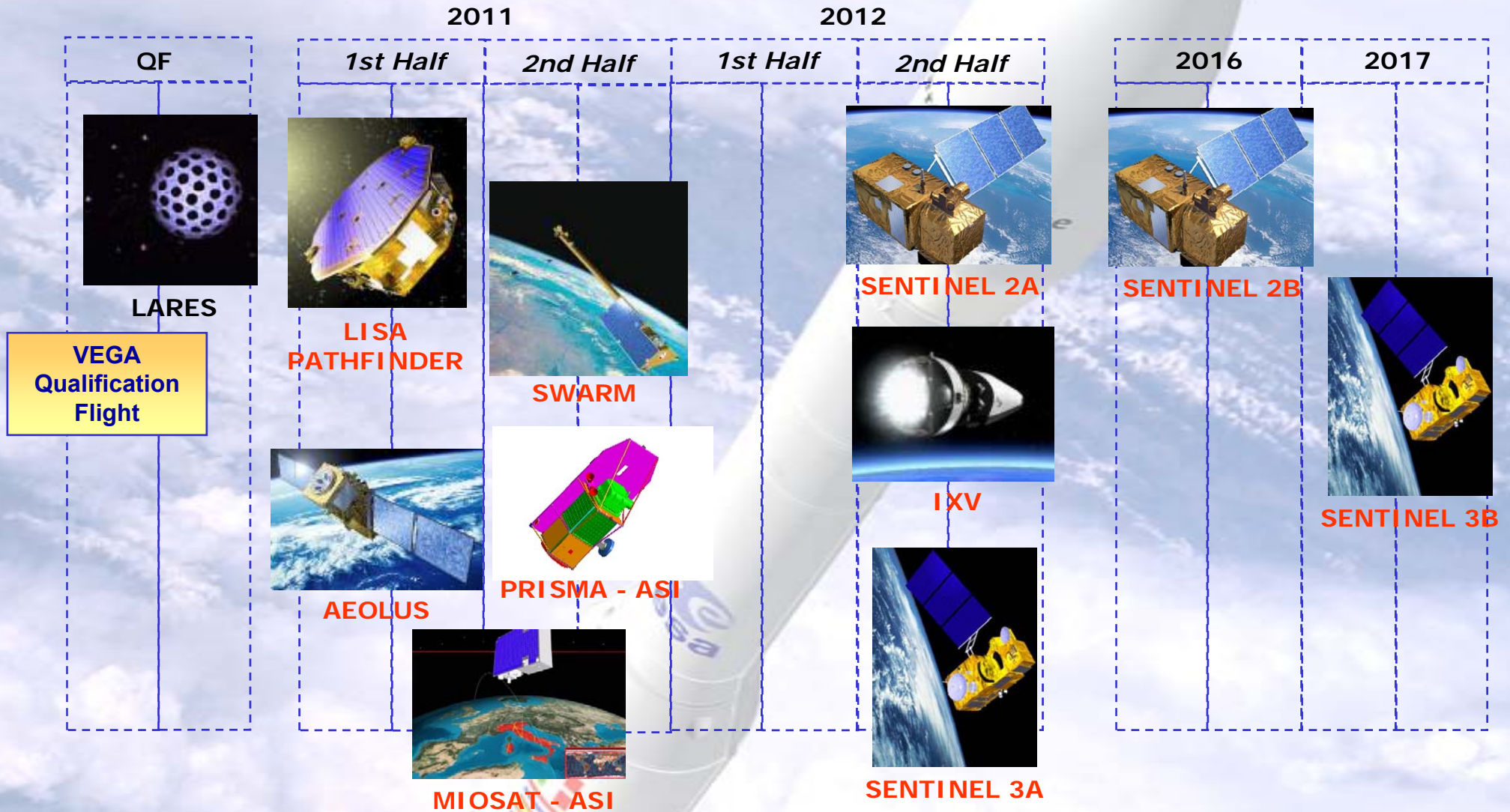
TYPICAL MISSION PROFILES

- Earth observation, scientific and meteorological satellites delivered directly into Sun Synchronous Orbit (SSO), Polar Circular Orbit or Circular Orbits with varied inclinations and in Low Earth Orbit (LEO).
- Vega AVUM's multiple burn capability offers excellent flexibility to a wide range of elliptical and circular orbits.
- A typical flight profile begins with a sub-orbital ascent performed by Vega's three solid propellant stages, followed by several (up to five) burns of the AVUM.
- The final AVUM burn is made for the stage's own reentry or orbit disposal, in order to comply with the stringent rules to reduce the orbital debris risk.

Vega Performance Map - Circular Low Earth Orbits







VEGA MARKET

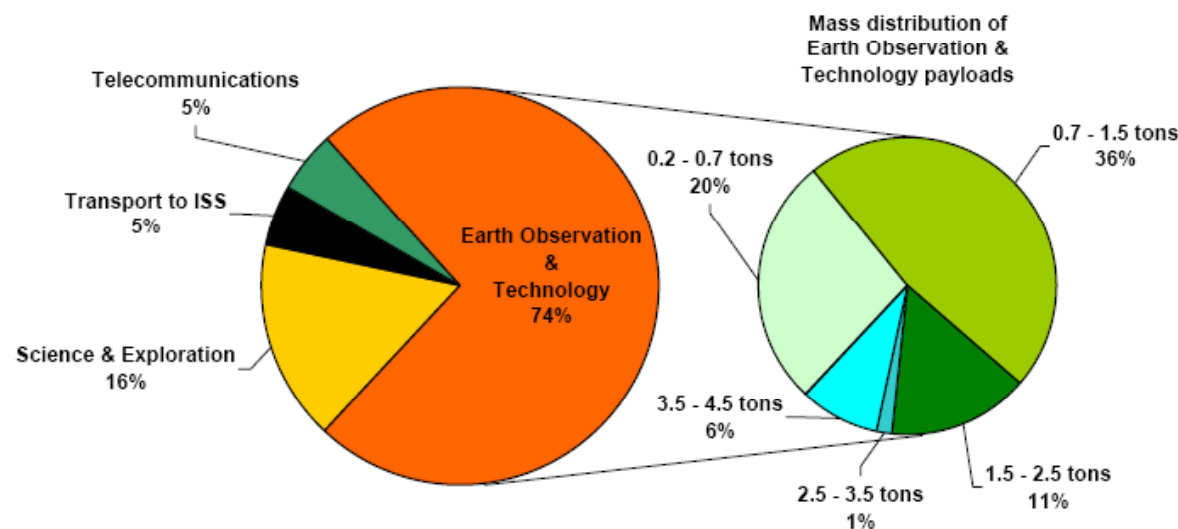
for short term (up to 2015)

Application	Type of orbit	European Institutional	European non-Institutional	Non-European	Total
Earth Observation & Technology	SSO, LEO	31 payloads (0.5 - 4.2 tons)	28 payloads (0.3 - 4 tons)		59 payloads (0.3 - 4.2 tons)
Science & Exploration	LEO, HEO, Escape	13 payloads (0.5 - 6.5 tons)			13 payloads (0.5 - 6.5 tons)
Telecommunications	LEO		4 payload (5 - 6 tons)		4 payload (5 - 6 tons)
Transport to ISS	LEO	4 ATV missions (20 tons)			4 ATV missions (20 tons)
	Total	48 payloads	32 payloads		80 payloads

VEGA Main Missions

Earth Observation & Technology from European Institutional agency

Market's interest on the VEGA P/L classes considering its performances vs cost per Launch



Potential Market linked to the new constellation of satellite

- Galileo
 - Globalstar
 - Iridium
- plus microsatellites

VEGA MARKET

for medium term (2015÷2020)

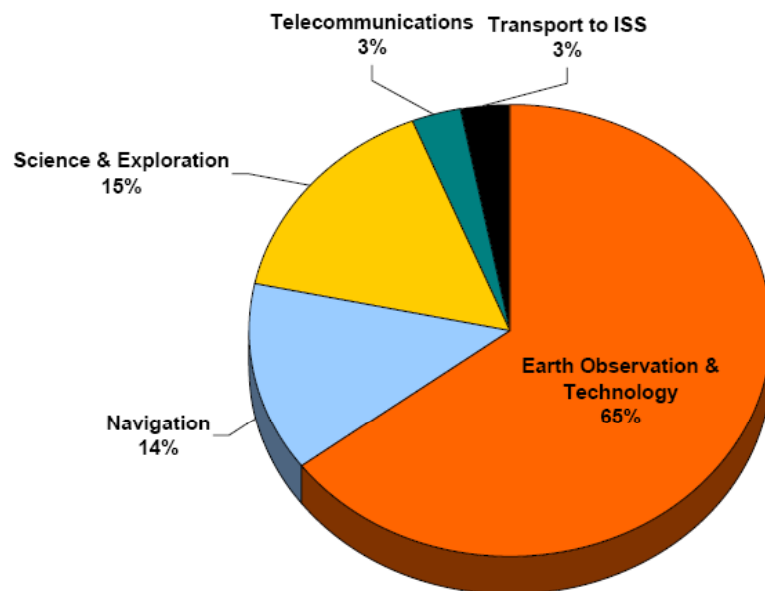
Application	Type of orbit	European Institutional	European non-Institutional	Non-European	Total
Earth Observation & Technology	SSO, LEO	22 payloads (0.2 - 4.5 tons)	20 payloads (0.3 - 4 tons)		42 payloads (0.2 - 4.5 tons)
Science & Exploration	LEO, HEO, Escape	9 payloads (0.3 - 6.5 tons)			9 payloads (0.3 - 6.5 tons)
Navigation	MEO	10 payloads (0.7 - 1 tons)			10 payloads (0.7 - 1 tons)
Telecommunications	HEO		2 payloads (5 - 6 tons)		2 payloads (5 - 6 tons)
Transport to ISS	LEO	2 ATV missions (20 tons)			2 ATV missions (20 tons)
	Total	43 payloads	22 payloads		65 payloads

VEGA Main Missions

Earth Observation
& Technology

Market's growing for
the P/L class up to
2500 kg

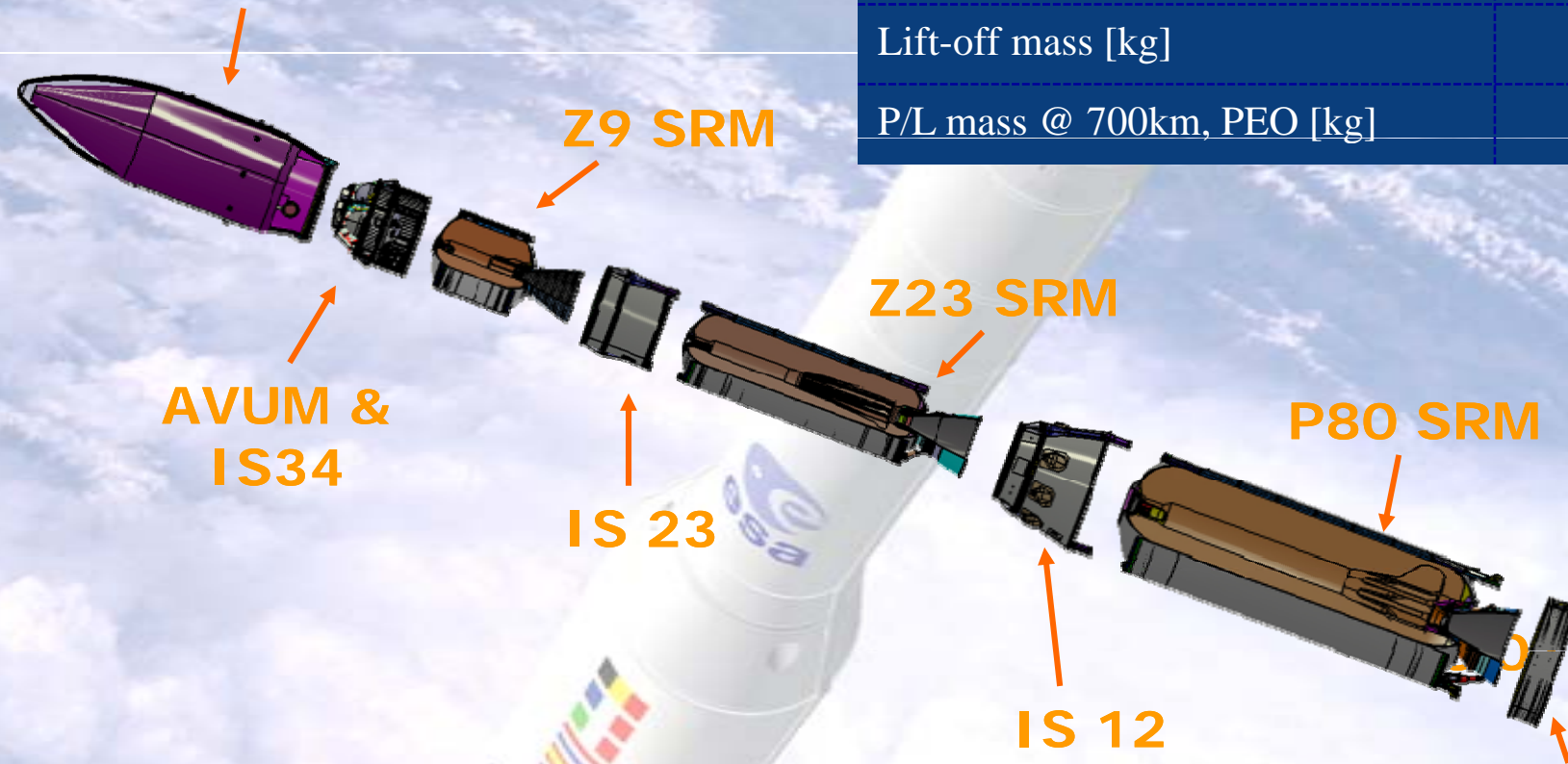
Potential Market linked to
the replacement of old
satellites plus
microsatellites

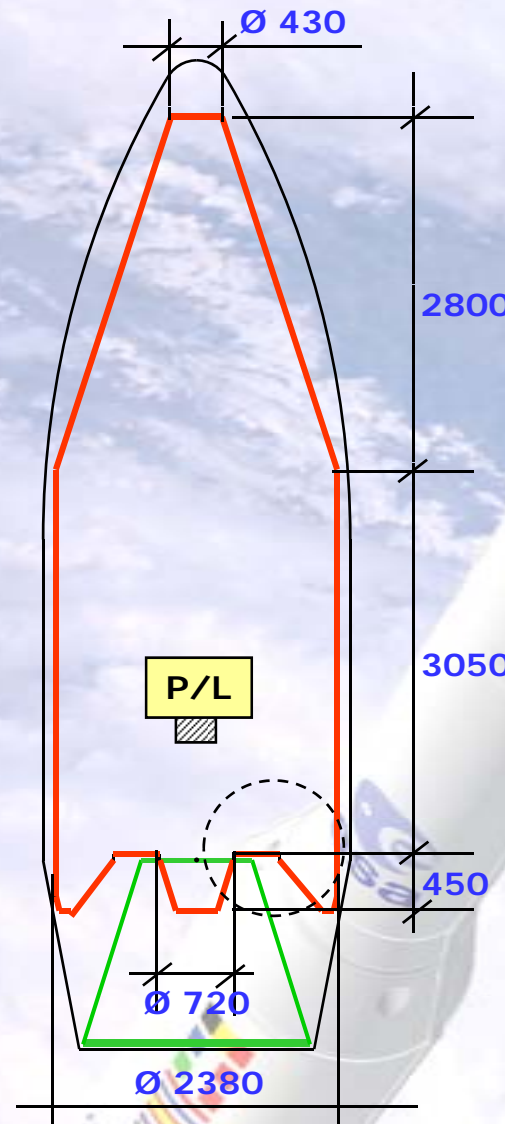


OVERALL CHARACTERISTICS

Overall height [m]	30.2
Maximum diameter [m]	3.0
P/L envelope (diameter) [m]	2.3
P/L envelope (cyl. length) [m]	3.0
Lift-off mass [kg]	137 000
P/L mass @ 700km, PEO [kg]	1500

Payload composite





- EXTERNAL STRUCTURE
- PAYLOAD ENVELOPE
- P/L ADAPTER VG937B

The Fairing of VEGA has been designed to accommodate :

- N° 1 Single Main P/L
- N° 2 Single Main P/L (VESPA)
- N° 1 Single Main P/L + microsattellites



Figure 1: ACU 937 VEGA ADAPTER

- The figure represent the standard P/L adapter so called 937 that has the same interface derived from ARIANE programme
- It is designed to withstand all the structural loads deriving from the main P/L mass ranging from 300÷2500 kg and relevant environmental loads

VESPA (VEga Secondary Payload Adapter) general view

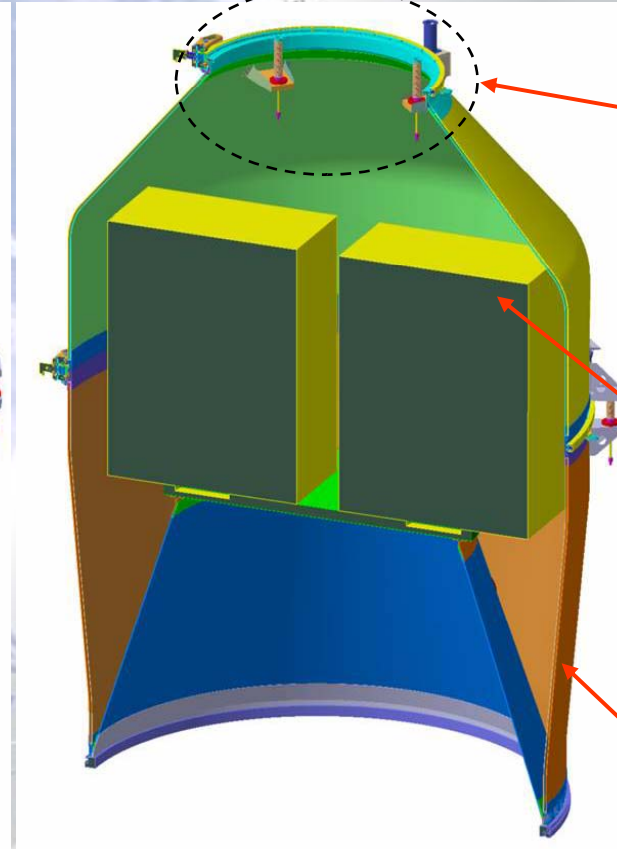
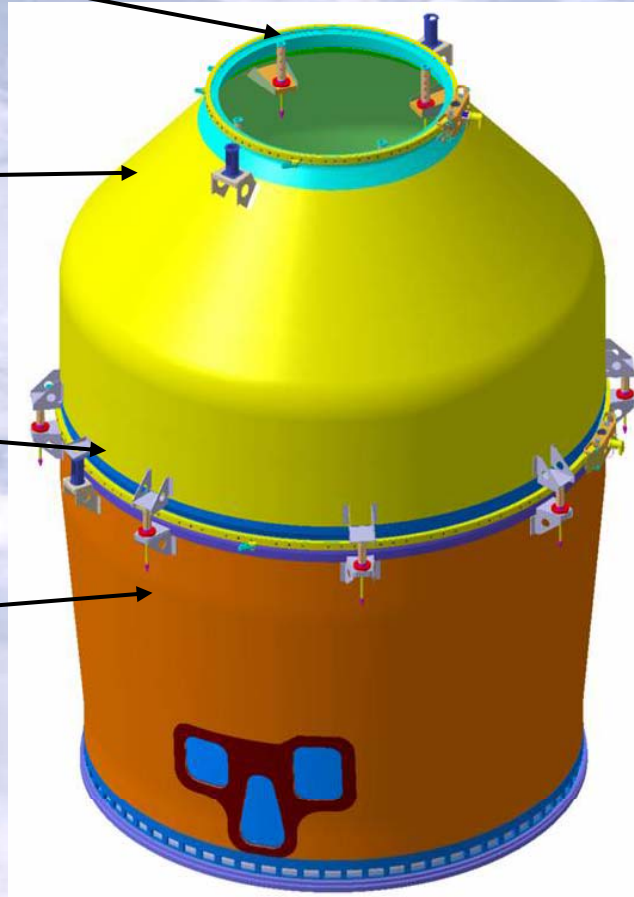
VESPA SECTION VIEW

LPSS 937
(Separation System)

Upper Part

LPSS 2105
(Separation System)

Boat-tail



MAIN P/L

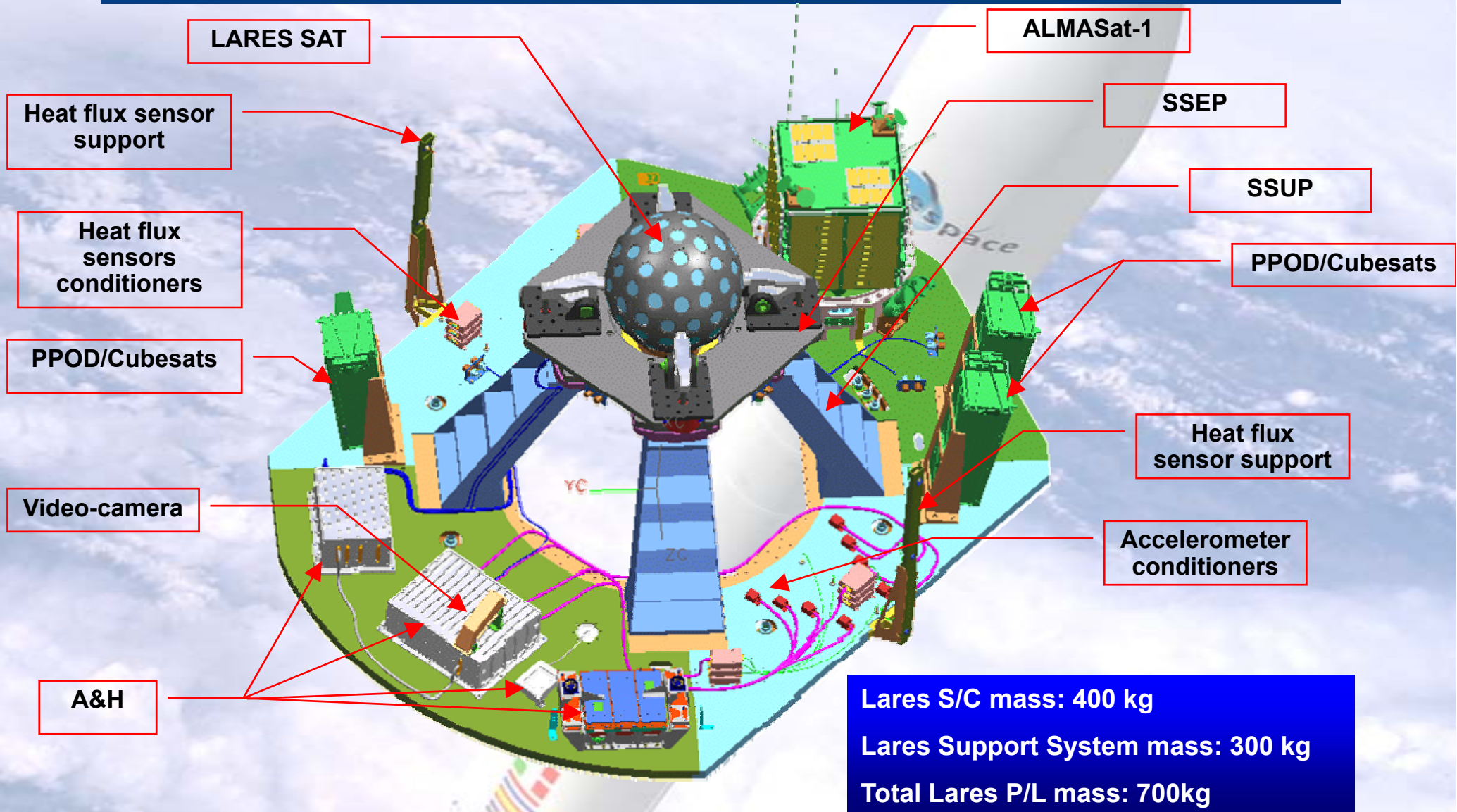
Mass \leq 1000 kg

SECONDARY P/Ls

Mass \leq 200 kg for one

and the maximum aggregated mass shall not exceed 600 kg

DERIVED FROM 937



The VEGA Qualification Flight is optimized to inject the LARES Satellite in its nominal operational orbit :

- **Circular Orbit**
- **Apogee/Perigee Altitude = 1450 x 1450 [km]**
- **Inclination = 71 [deg]**

In addition a set of micro satellite :

- **N° 9 CubeSats microsatellite**
- **ALMASat-1.**

shall be also released at the end of AVUM Deorbiting phase
with Apogee/Perigee altitude **1450x340 [km]**

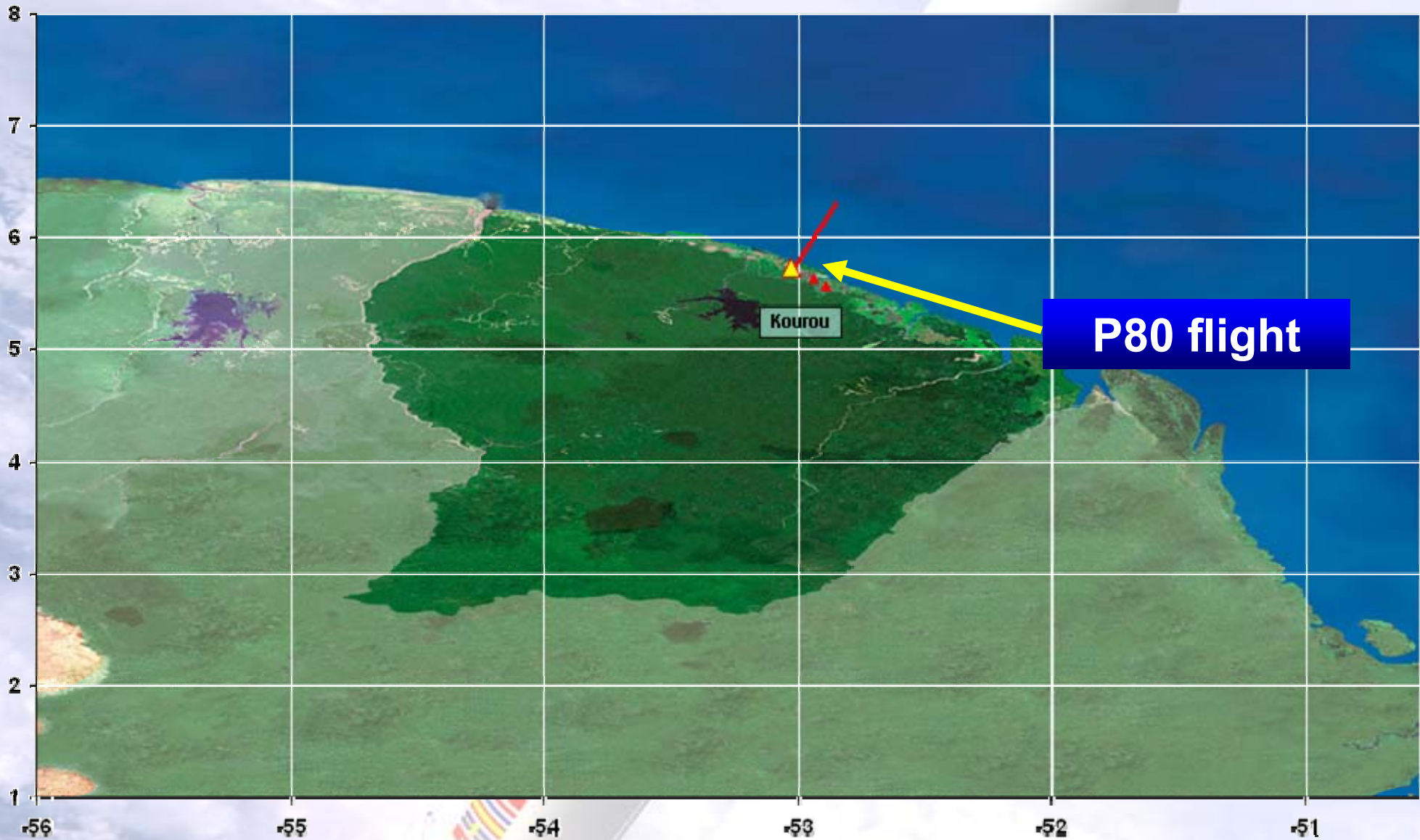
MAIN FLIGHT EVENTS	FLIGHT TIME
	[sec]
P80 ignition	0.0
Vertical flight end/Pitch Over Start	4.4
P80 Threshold Detection	113.65
1 st stage (P80) separation	114.3
Z23 ignition	115.1
Z23 Threshold Detection	192.12
2 nd stage (Z23) separation	203.1
Z9 ignition	215.5
Fairing separation	221.0
Z9 Threshold Detection	336.25
3 rd stage (Z9) separation	349.2
1 st ignition of AVUM LPS	356.2
1 st cut-off of AVUM LPS	567.8
2 nd ignition of AVUM LPS	2990.7
2 nd cut-off of AVUM LPS	3230.0
PL release	3380.0
3 rd ignition of AVUM LPS	4080.0
3 rd cut-off of AVUM LPS	4213.4



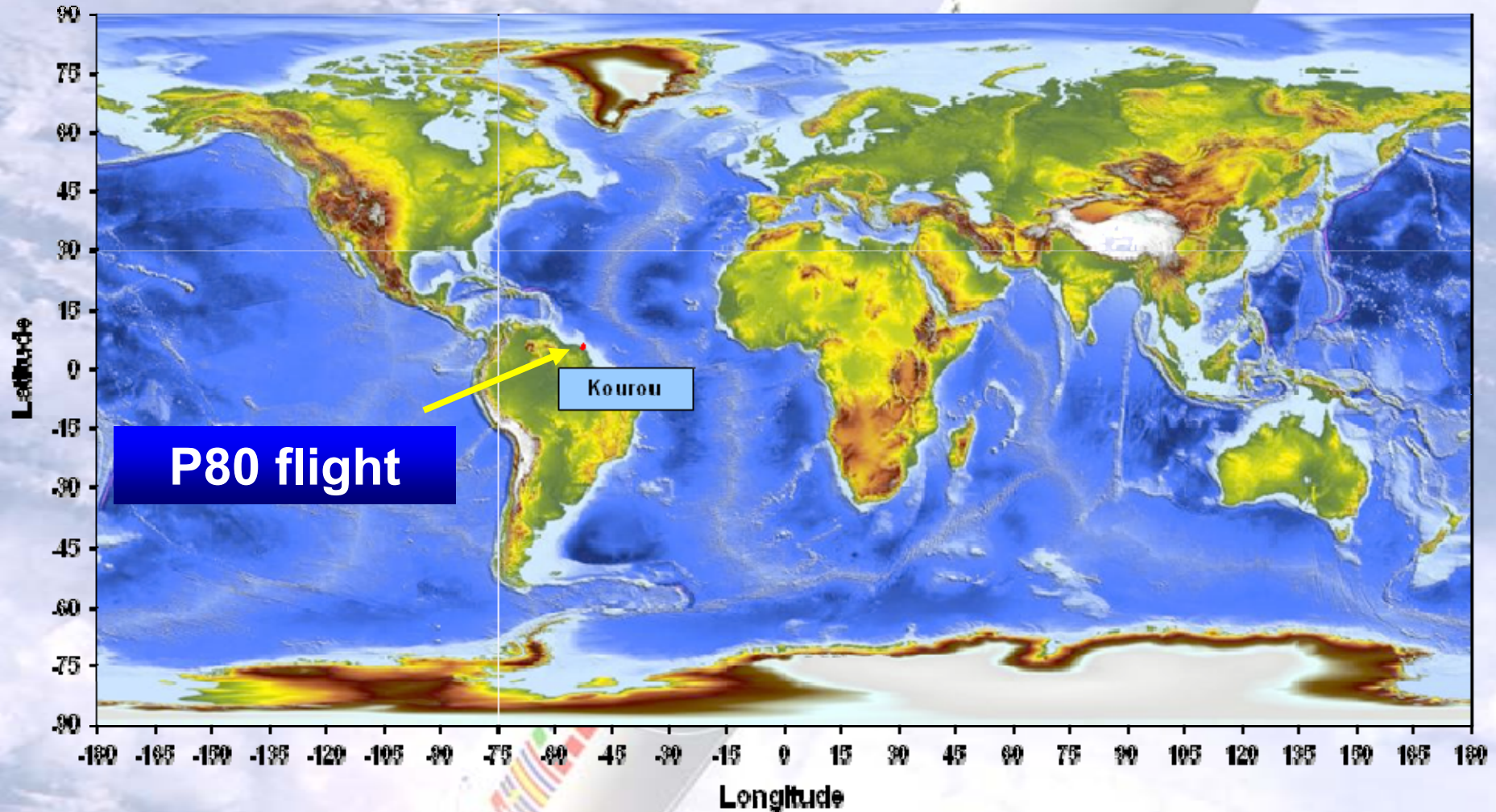
**LARES MISSION
FLIGHT TIMELINE**

**LARES
INJECTION TIME**

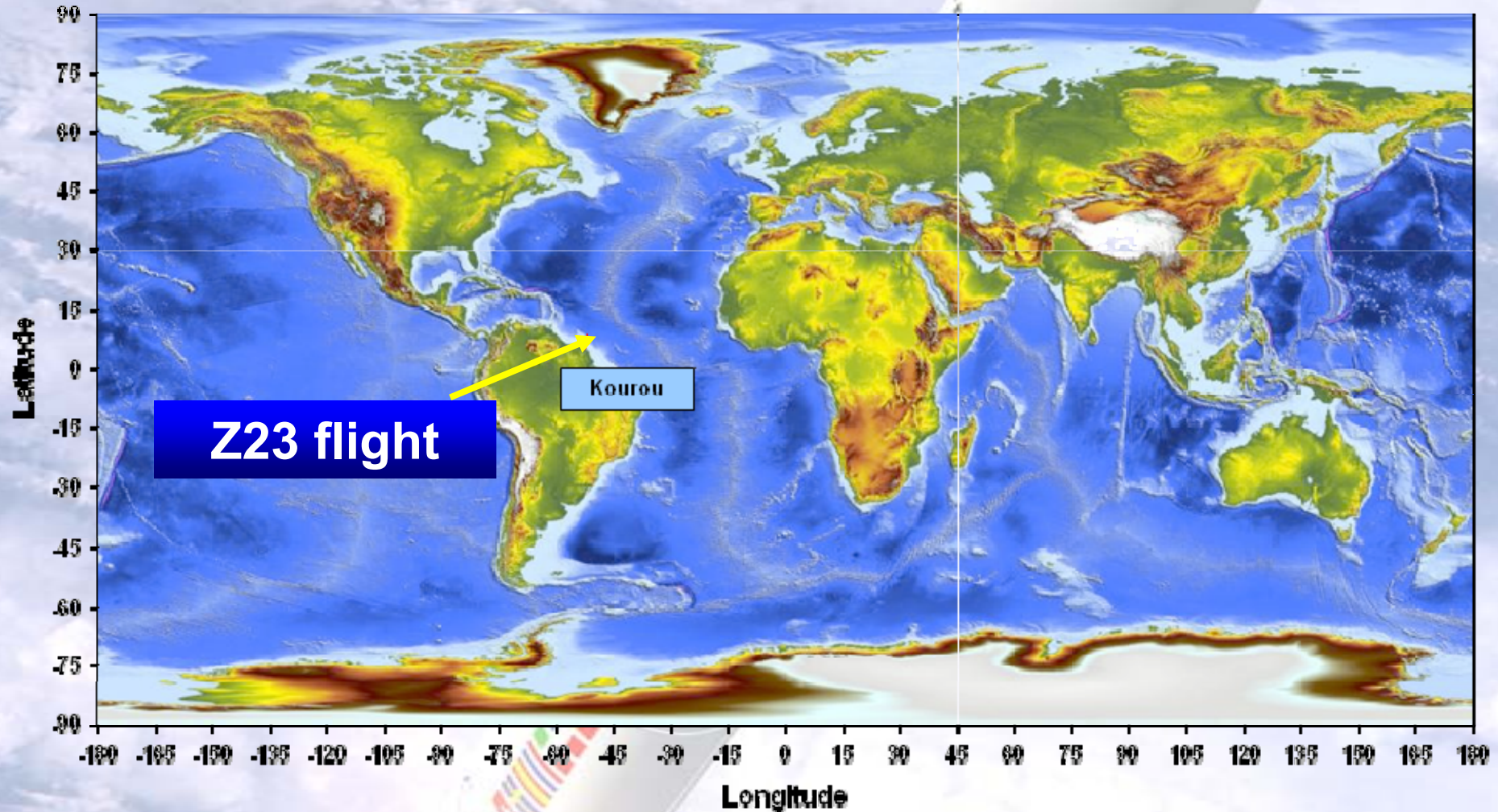




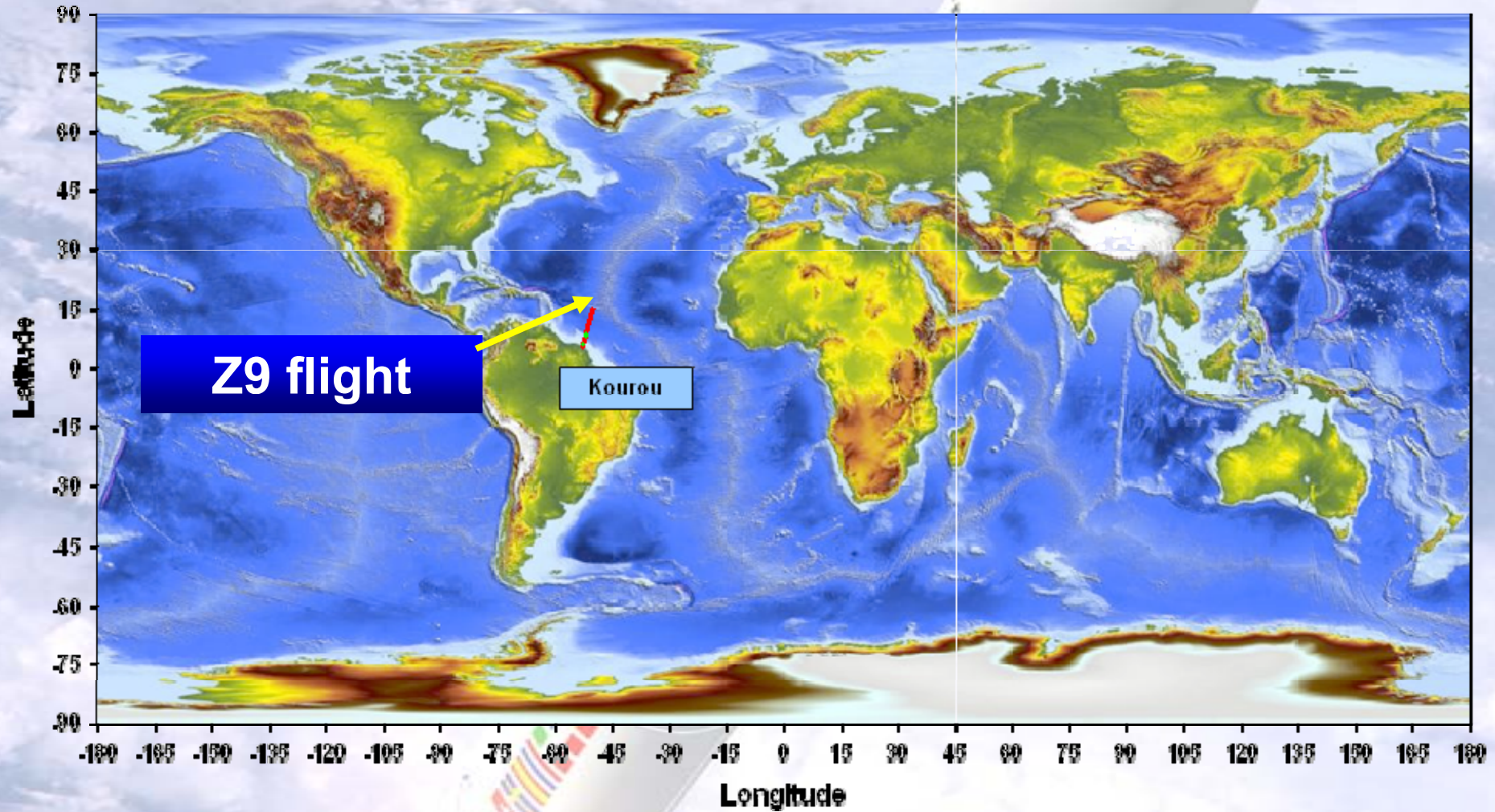
Vega LV LARES Mission Ground Track



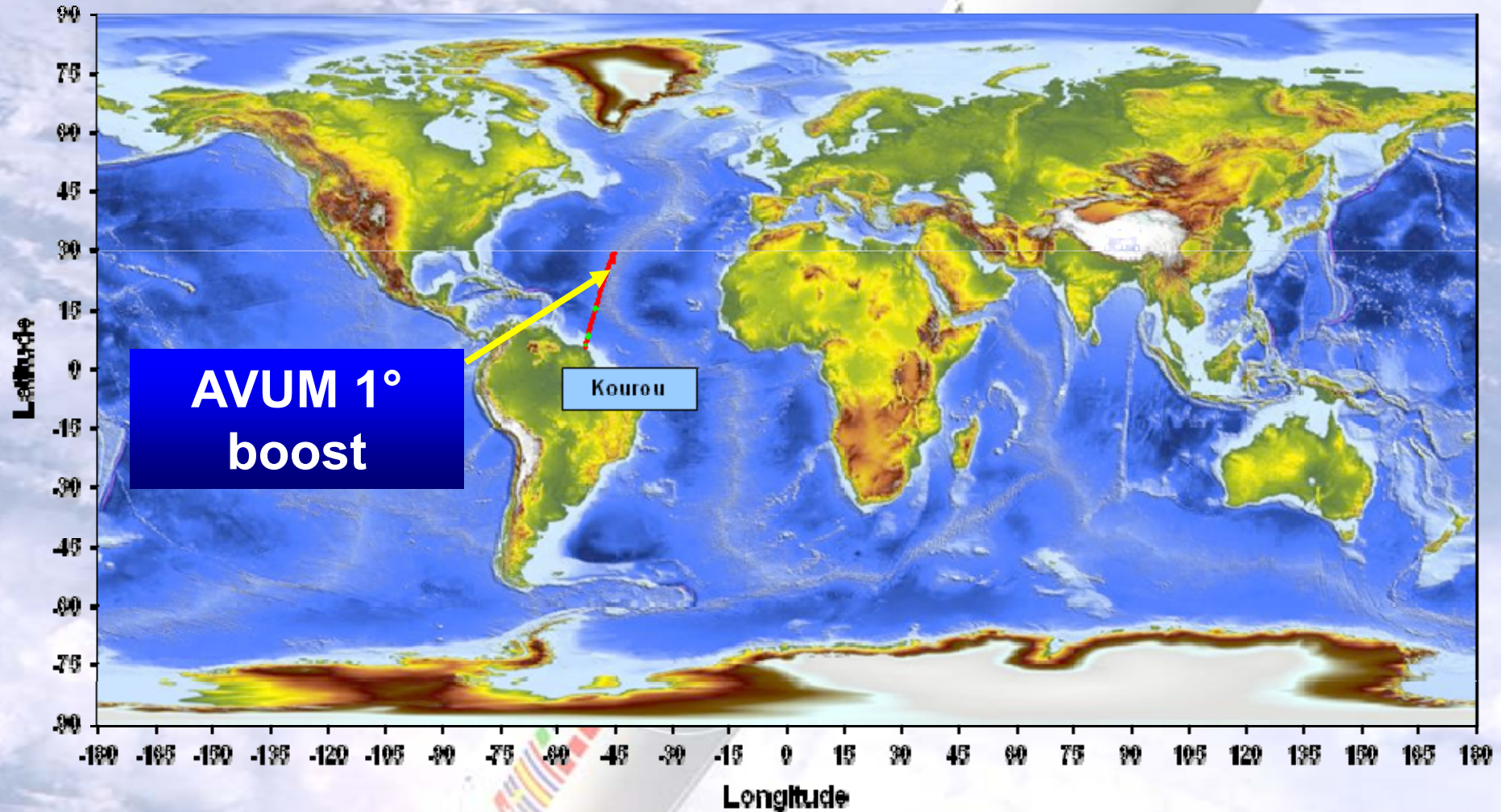
Vega LV LARES Mission Ground Track



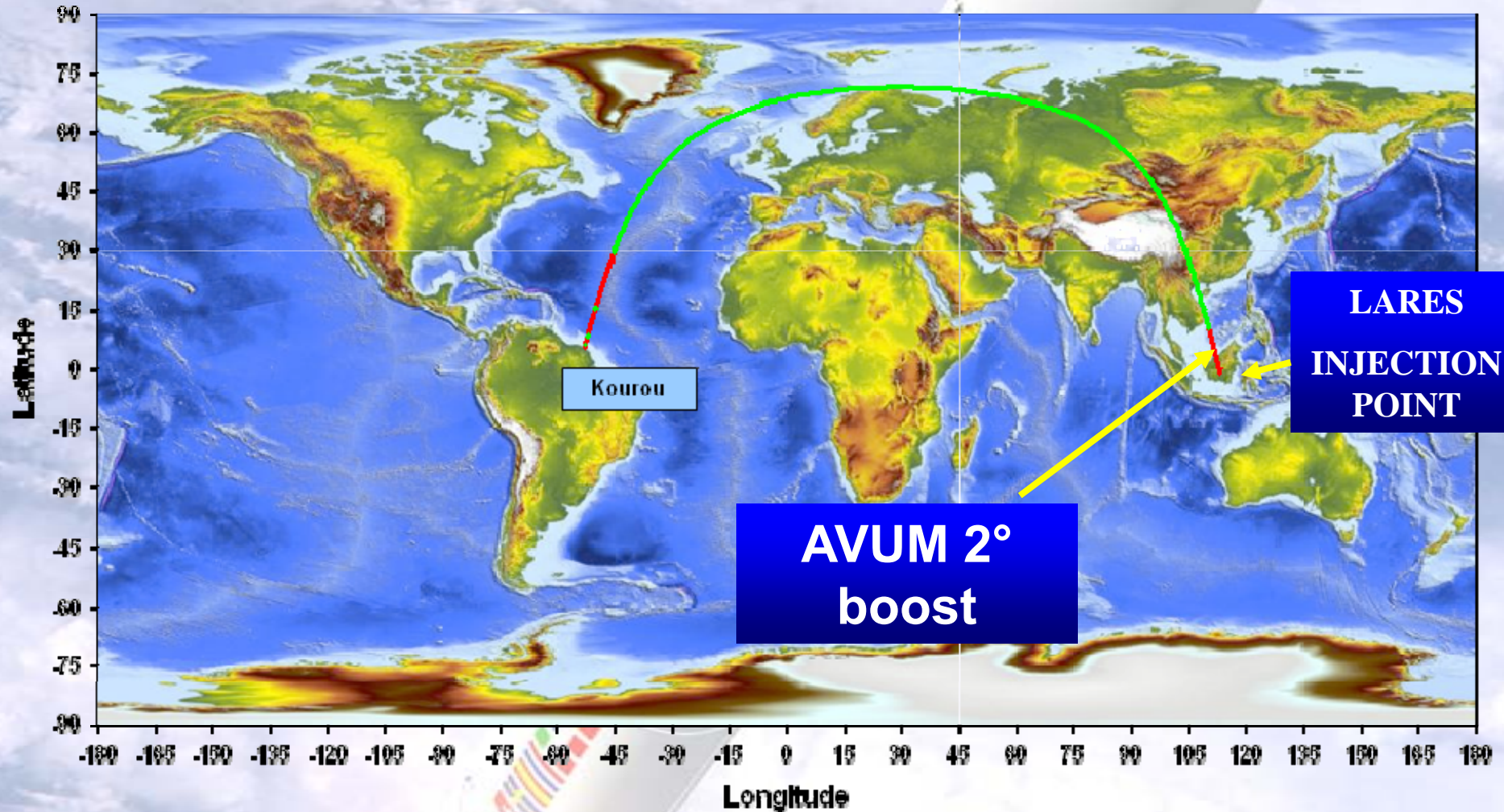
Vega LV LARES Mission Ground Track



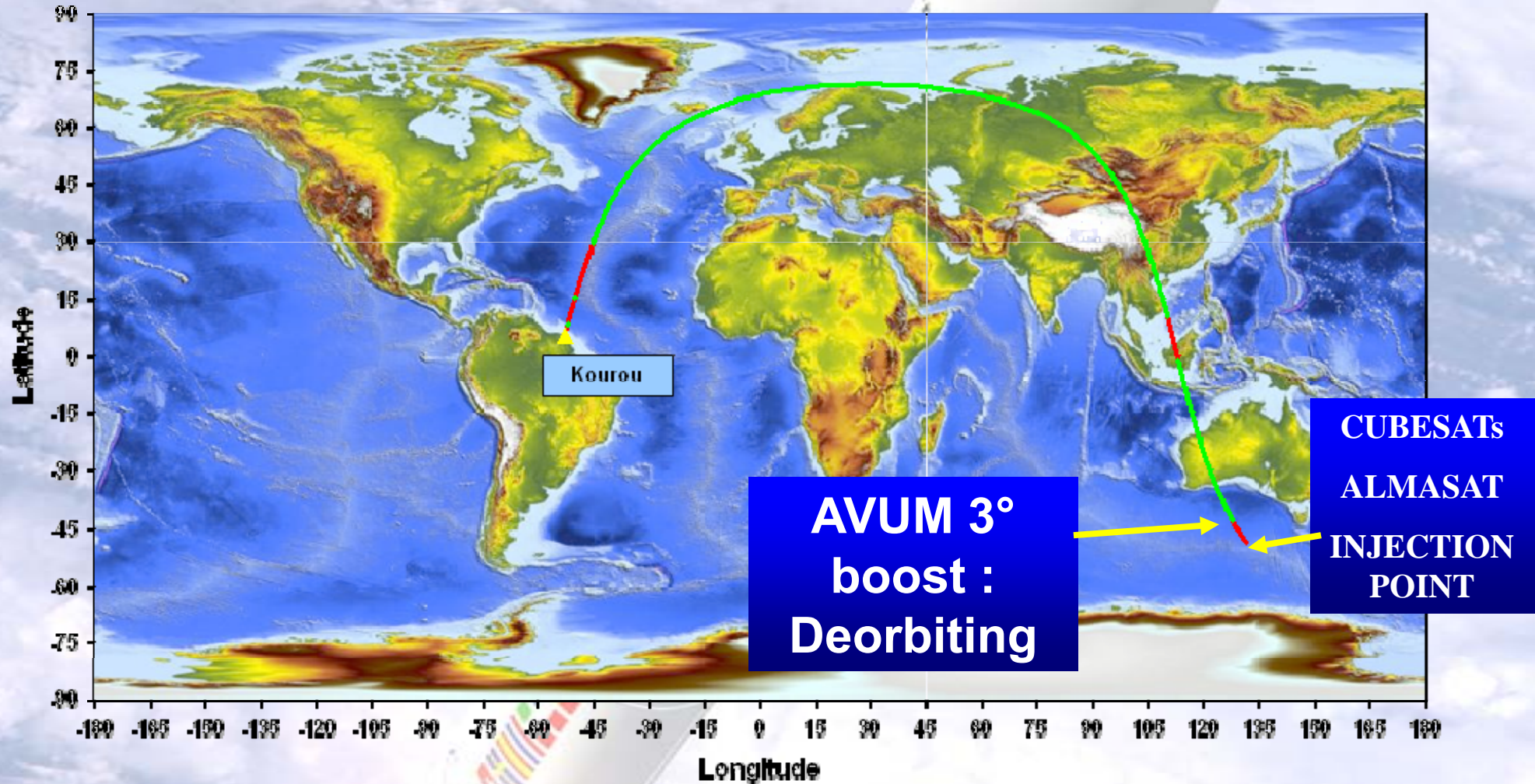
Vega LV LARES Mission Ground Track



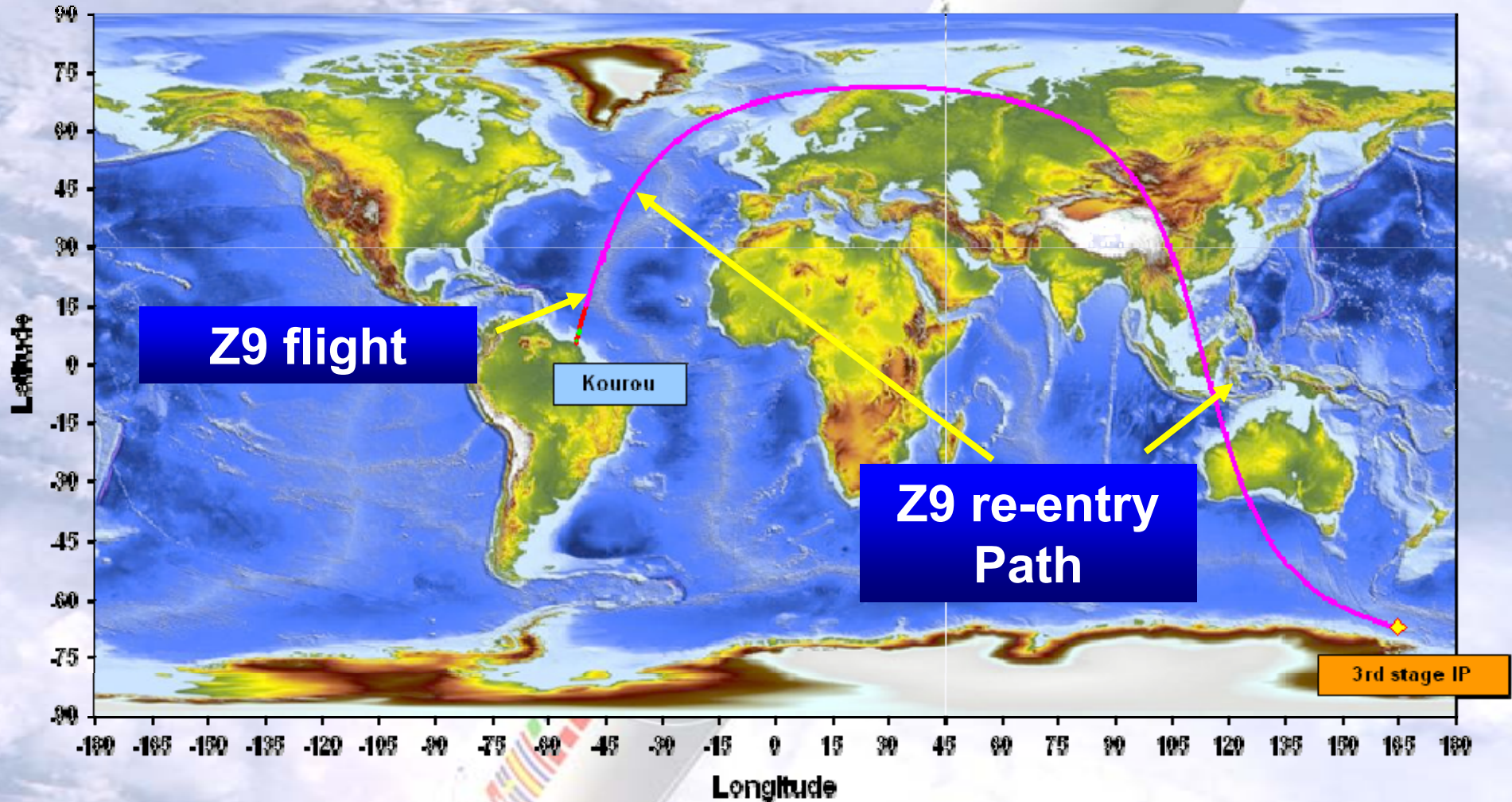
Vega LV LARES Mission Ground Track



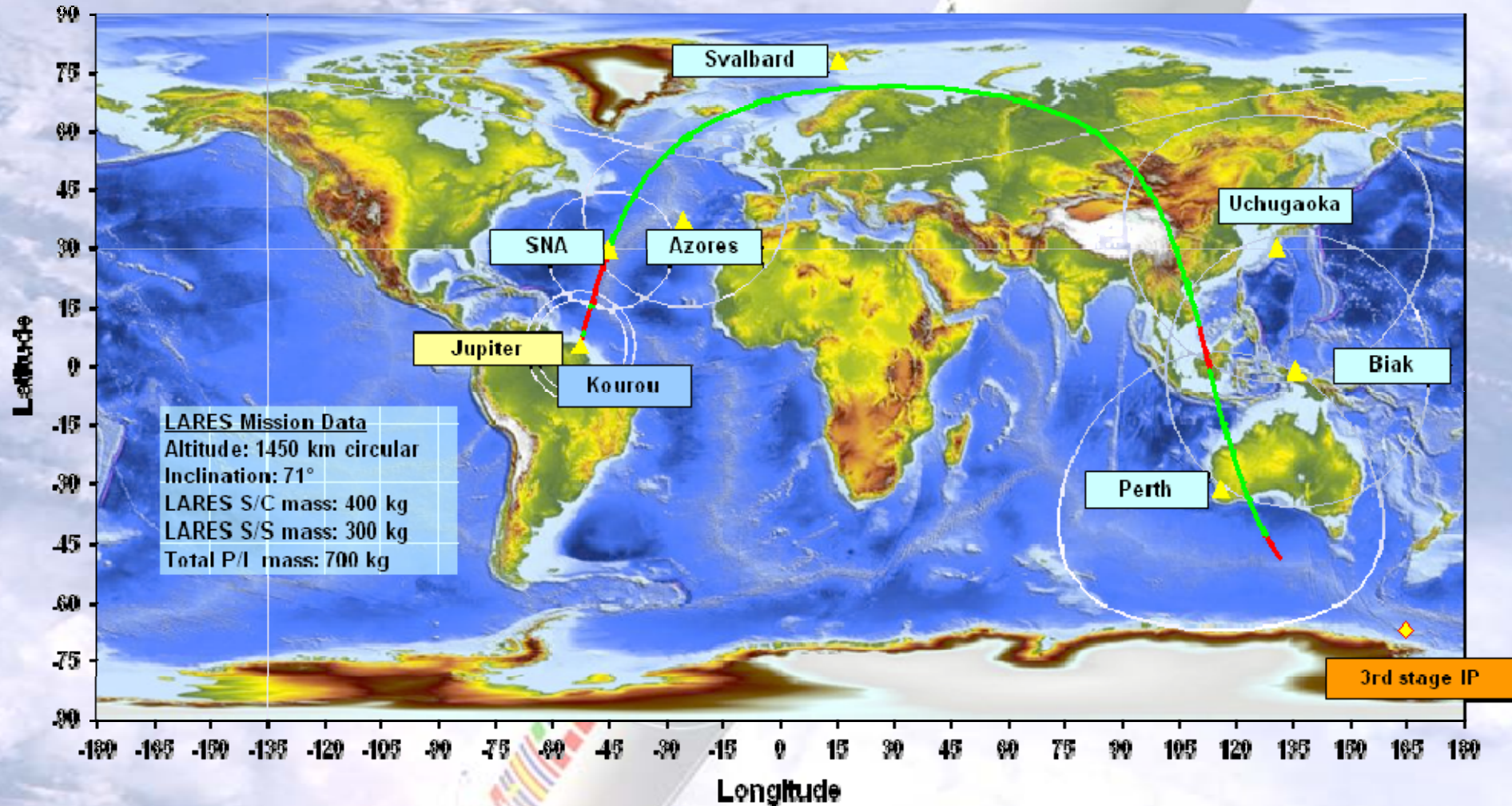
Vega LV LARES Mission Ground Track



Vega LV LARES Mission Ground Track



Vega LV LARES Mission Ground Track





VEGA TYPICAL MISSION SIMULATION

[Vega Presentation.wmv](#)