Laboratory for Atmospheric and Space Physics
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Strateóle 2: A Unique Super Pressure Balloon Campaign For Long Duration, Quasi-Lagrangian, Chemical And Dynamical Measurements In The Tropical Tropopause Layer

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Campaign Design

- Stratéole 2 is a long duration scientific ballooning campaign to study the Tropical Tropopause Layer (TTL) and lower stratosphere
- The project consists of 3 ballooning campaigns – a validation campaign in 2017 and two science campaigns in 2019 and 2020
- Each science campaign will launch a flotilla of 12-20 balloons near the equator
- Each balloon is designed to fly for 3+ months, and circumnavigate the Equatorial belt 2-3 times.

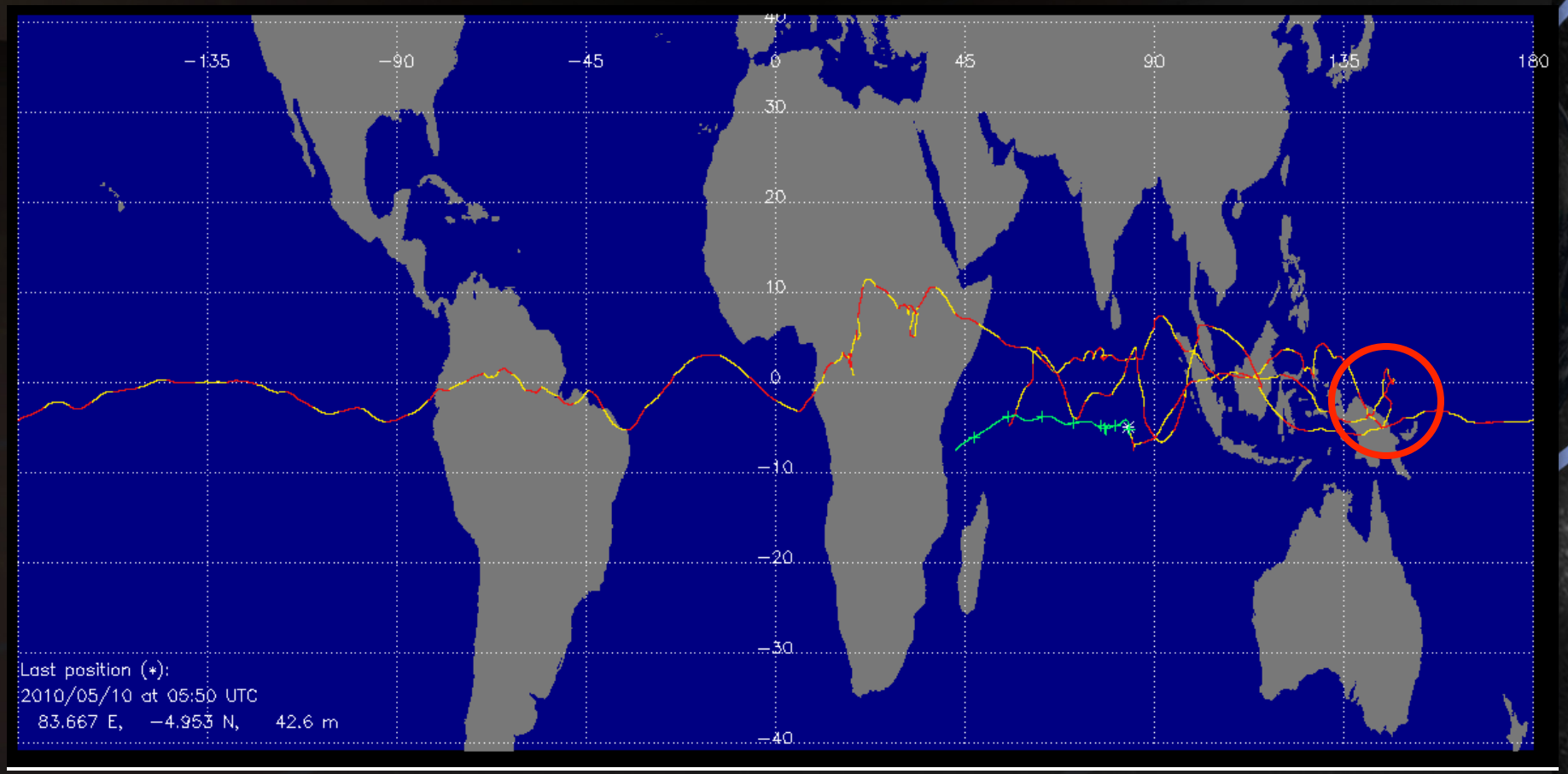
Science Themes

- Transport, Dehydration and Chemistry in the TTL
  - Water vapor, trace gases and aerosols
  - Upwelling and cold point dynamics
  - Cirrus Clouds
  - Turbulence and mixing
- Dynamics of the Equatorial Stratosphere
  - Gravity Waves
  - Operational Meteorology
  - Satellite Validation

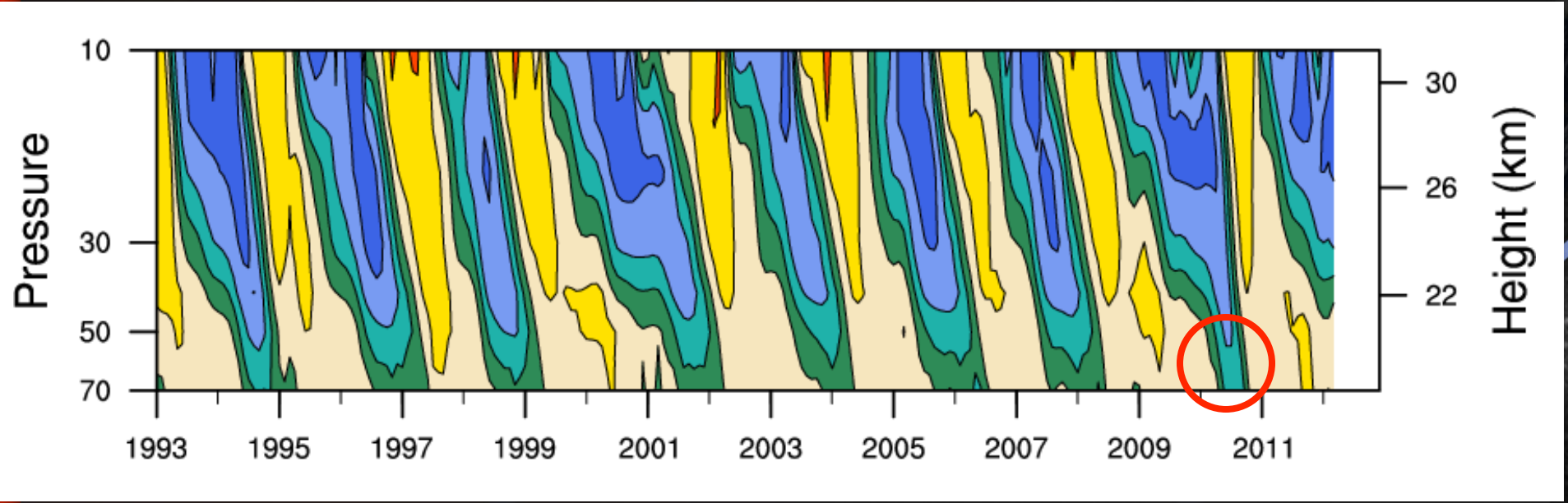
Heritage

- Stratéole 2 builds on prior successful long duration balloon campaigns: Strateole/Vorcore (2005), Amma (2006) , Concordiasi (2010).
- Demonstrated CNES ability to produce and deploy super pressure balloons in the lower stratosphere.
- Successful deployment and demonstration of many of the instruments planned for Stratéole 2.
- Validated mission control, data downlink, and launch operations.
- Pre-Concordiasi test flights took place the equator and established the concept of tropical long duration balloon flights

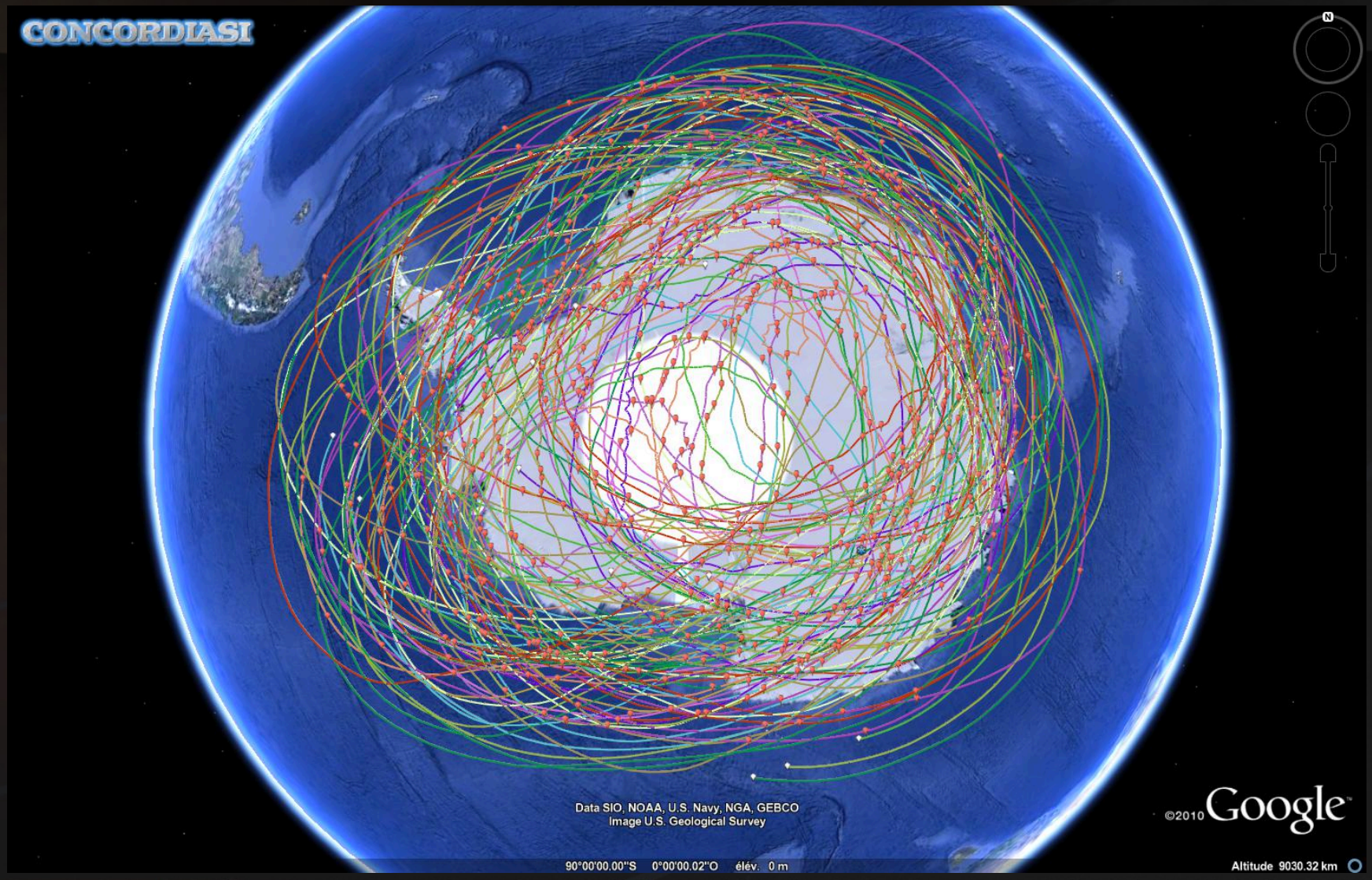
Pre-Concordiasi Flights



Pre-Concordiasi Flights



Geographic Coverage

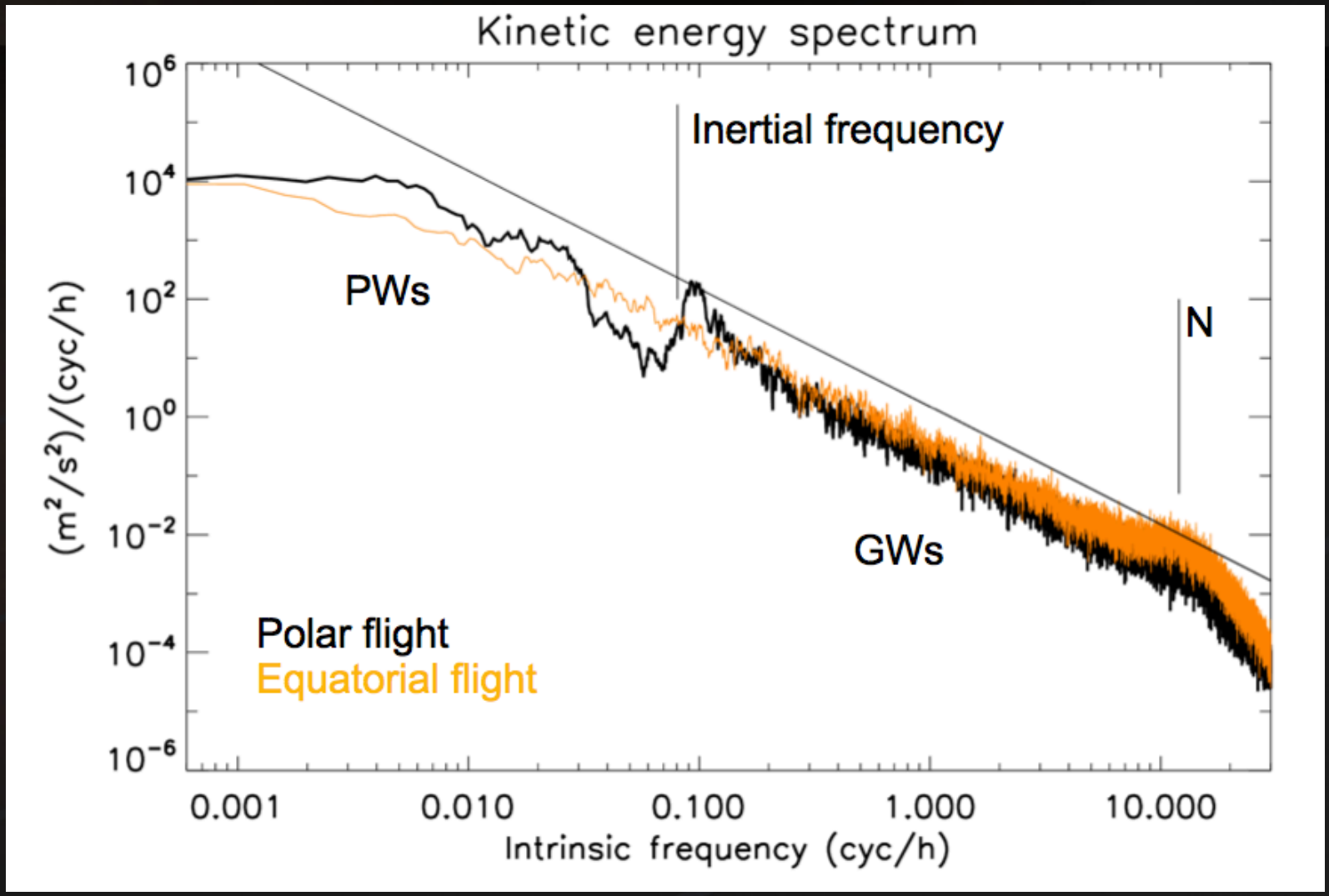


Balloon Platform

- Super Pressure (constant density) balloons
- Two flight levels
  - 11m diameter balloons at 120g/ m^3 (~70 hPa or 18km)
  - 13m diameter balloons at 100 g/ m^3 (~50 hPa or 21km)
- Cover latitude band 20°S to 15°N
- Total mass ~ 45Kg, ~10Kg available for instrumentation.
- Modular payload configuration – 2-3 instruments/balloon to target specific science questions
- Near real-time data download.

Instrument	Measurement	Precision / Resolution	Investigator	Institution
GPS	3D Position	3m / 0.1ms^{-1}	Venel	CNES
TSEN	P and T	0.2K, 8Pa	Hertzog	LMD
Pico-SDLA	$H_2O/CO_2/CH_4$		Durry	GSMA
SAWfPHY	H_2O	5%	Hertzog	LMD
UCOz/B-Bop	Ozone	2% / 10ppbv	Kalnajs/ Hertzog	LASP/LMD
GPS - RO	Temperature Profiles	250m (vertical)	Haase	Scripps
LOAC	Aerosol Sizing		Renard	CNR
WOPC	Aerosol Sizing	0.075 – 15um	Deshler	U. Wyoming
Fiber Optic Profiler	Temperature Profiles	3m vertical res., 1K prec., 3km below balloon	Kalnajs	CU - LASP
Flash/COBALD Reeldown	H_2O, Backscatter, Temperature Profiles	8 profiles/day 2km Below balloon	Davis/Hurst	CU - NOAA
Serb	Longwave Flux		Hauchecorne	LATMOS
Pico-LIDAR	Attenuated Backscatter	30m resolution 5km below ball.	Fierli	CNR

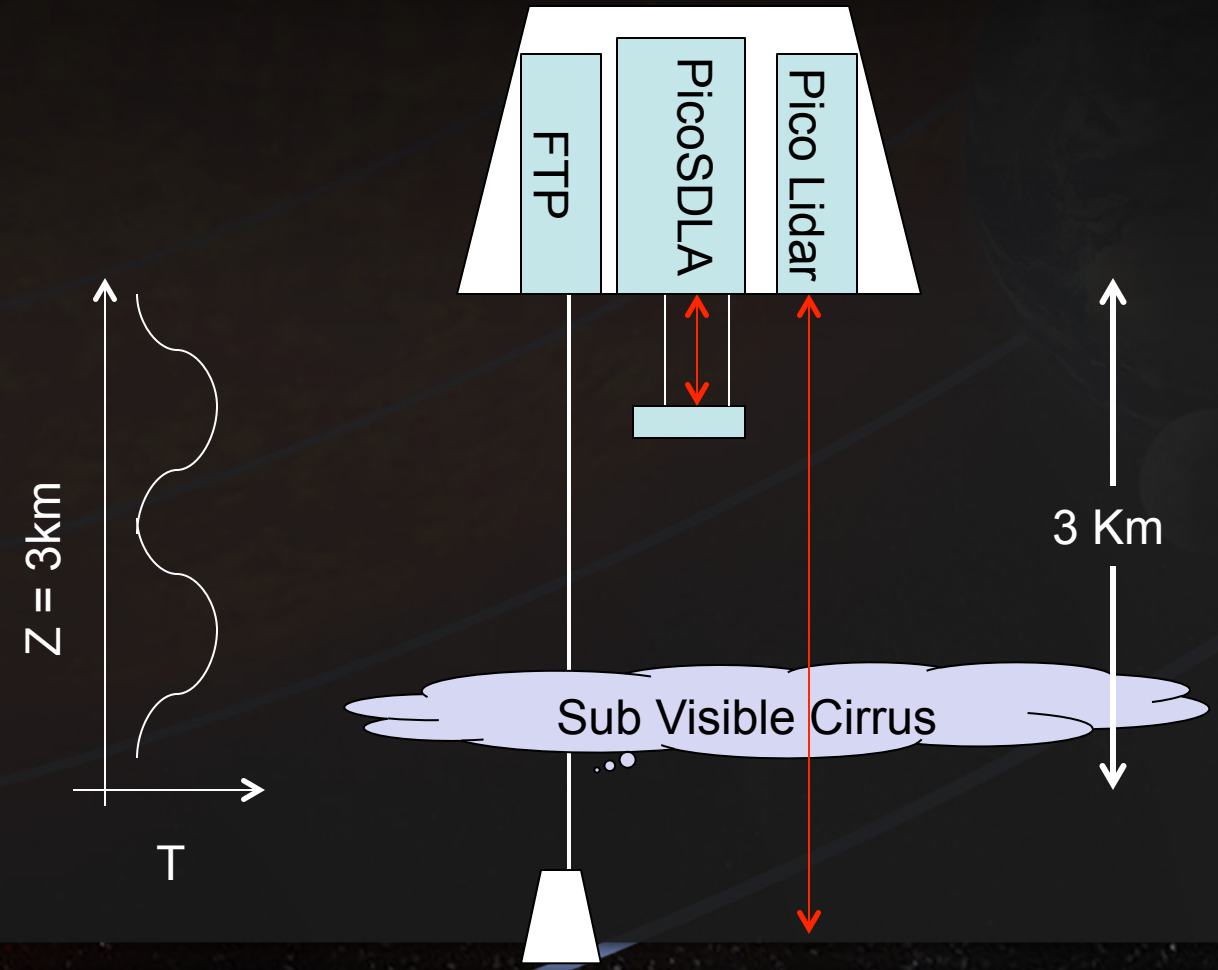
Quasi-Lagrangian Trajectories



Courtesy of Albert Hertzog

Targeted Payload Configuration

Targeted question: wave driven cirrus cloud formation and dehydration



Unique Capabilities

- 200+ high resolution temperature profiles of the LS/TTL per balloon per day (100,000+ for campaign)
- 2000+ water vapor and backscatter profiles of the LS/TTL over the campaign
- ~120 circumnavigations of the equator
- Continuous measurements LS winds from all the balloons
- Unbiased sampling over continents and oceans

Strateóle 2

Questions?

Comments?

Suggestions?