

Real-Time use of IAGOS observations

Users of Real-Time data

Air Quality

The GMES (Global Monitoring for Environment and Security) Initiative of the EU and ESA prepares operational Atmospheric Services to predict Regional Air Quality by 2014. Regional air quality modelling needs observed chemical profiles :

- in the boundary layer to observe emissions of precursors of pollution and to document tracks of old inversion layers, and
- in the free troposphere to observe stratospheric air intrusions, or pollutants and reservoir Species transported away from remote production areas.

IAGOS profiles will be used for validation of numerical prediction and later for initialization of numerical simulation using assimilation techniques (data less than 12h old).

Weather Prediction

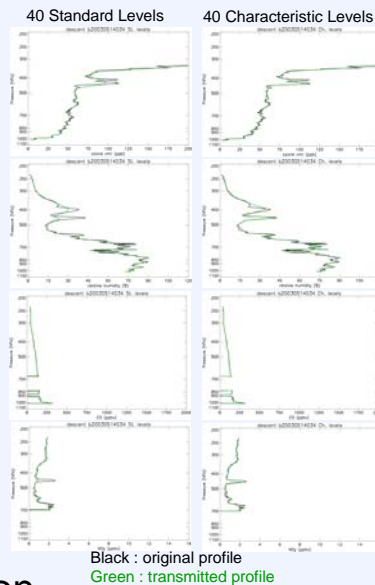
Distribution of gases, aerosol and cloud particles impact the radiation budget and weather.

On board processing

is required to reduce the volume of data transmitted to the ground and data transmission costs.

Selection: The atmosphere is sampled during ascent and descent phases. Details of the vertical structure are well described by 40 characteristic levels. The levels are determined for each ascent or descent (see green line in right column) by simultaneously minimizing the total error in all constituent profiles. This method is more accurate than using standard pressure levels (green line in left column).

Compression: Each profile is compressed on board into a binary file. (IAGOS report format : 1 profile = 5000 bits)



Parameters transmitted in real-time

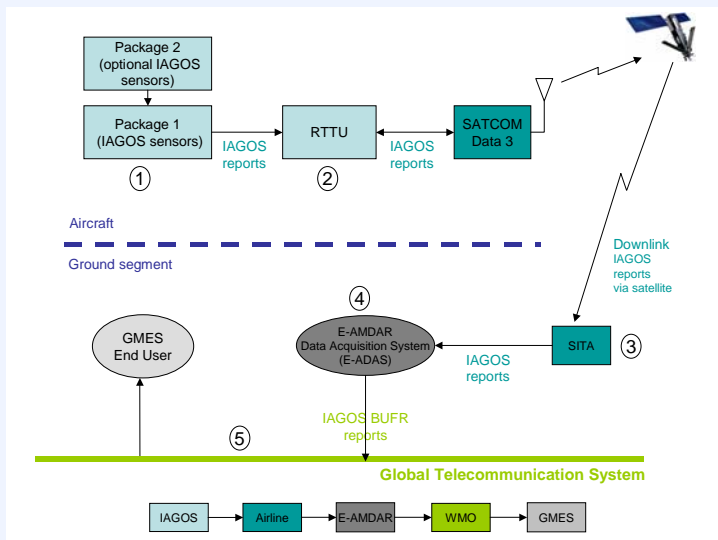
1. Parameters from aircraft sensors

	Unit	Absolute accuracy	Comments
Time	s	4	
Latitude/Longitude	degree	0.01 @ 1 km	
Pressure	hPa	4 to 1	From 1050 to 180 hPa
Temperature	K	0.5	
Horizontal wind speed	m/s	2	
Horizontal wind direction	degree	1	

2. Parameters from IAGOS sensors

	Unit	Relative accuracy	Detection limit	Comments : (P2A = instrumental Package)
O ₃ volume mixing ratio	ppb	2%	2	
Relative Humidity with respect to liquid water	%			Absolute accuracy is 5 to 10 %.
CH ₄ volume mixing ratio	ppb	0.05%		(if P2D installed)
CO ₂ volume mixing ratio	ppm	0.05%		(if P2D installed)
CO volume mixing ratio	ppb	2%	5	
NO _x volume mixing ratio	ppt	10%	20	(if P2B installed)
NO _y volume mixing ratio	ppt	10%	50	(if P2A installed)
Total number of cloud particles in a vertical column of unit surface	m ⁻³	0.15		Pressure limits of cloud layer defined in (3)
Total area of cloud particles in a vertical column of unit surface	1	0.15		Pressure limits of cloud layer defined in (3). Not provided in case of ice particles
Total volume of cloud particles in a vertical column of unit surface	m	0.15		Pressure limits of cloud layer defined in (3). Not provided in case of ice particles
number density of aerosol with Diameter D > 5nm	m ⁻³	25%		(if P2C installed)
number density of aerosol with D > 14nm	m ⁻³	0.15		(if P2C installed)
number density of aerosol with 0.25µm < D < 2.5µm	m ⁻³	0.1		(if P2C installed)
non volatile aerosol ratio	1	0.1		(if P2C installed)

Real-Time transmission



1. Production of IAGOS reports is done inside instrumental Package P1.
2. RTTU is an interface between Package P1 and SATCOM.
3. Data Service Provider SITA (contractor of airline) sends the IAGOS reports to E-ADAS using geostationary satellites and its network of ground stations.
4. E-ADAS is the Data Acquisition System of the European AMDAR community.
5. At E-ADAS, IAGOS Reports are translated in BUFR Format and sent to the end-users over the Global Telecommunication System).

Link with the IAGOS Data Centre

IAGOS measurements are also transmitted after each flight, from the ground, to the IAGOS Data Centre using mobile phone network.

The IAGOS Data Centre contains the most complete and accurate data:

- delayed data processing can be performed using the calibration of the sensors before and after the flights.
- the quality of the data can be estimated using a variety of methods and comparisons.

The IAGOS Data Centre will contribute to the Global Atmospheric Watch Programme of WMO.

Real Time data downlinked during the flight (presented here) will be used only for Air Quality and Weather forecasting. The biases detected with other observations and model calculations will be forwarded to the IAGOS Data Centre for improving Real Time measurements.

Role of Météo-France in IAGOS Infrastructure

Météo-France's specific contribution to IAGOS is to **provide real time IAGOS data to air quality and weather predictions centres** worldwide.

The design of the real-time transmission is derived from the automated real-time transmission of meteorological observations made from commercial aircraft (AMDAR = Aircraft Meteorological Data Relay) that has been built from the 1980's.

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