Introduction

The Atmospheric Thematic Center (ATC) operates processing chains of atmospheric greenhouse gases mole fractions. The facility includes servers to:

- **Receive raw data files at least once per day**
- **Process and archive the data**
- **Generate data products updated daily to support the quality control of the dataset**
- **Run a graphical application allowing to configure the station/instrument setup (ATCConfig)**
- **Run a graphical application allowing the quality control of the time series (ATCQC)**

The ICOS atmospheric database is the backbone of the system, developed with an emphasis on the traceability of the data processing and quality control.

Flagging Management

The are three main categories of quality flags.

**Name** | **Description**
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Internal | - Automatic cumulative flag associated to the different steps of the processing
- Set on raw data and all data aggregation levels
- Instrument dependent
User | - Simple letter flags to differentiate validated/invalidated data either through NRT processing or expert manual inspection
- Set on raw data and all data aggregation levels
- Instrument independent
Descriptive | - Simple letter flags from a limited list to provide the reasons for invalidating data or useful information for validating data
- Multiple flags can be set on a single data
- There are two separate sets, automatic and manual
- Set only on raw data
- Instrument independent

User flag list | Descriptive flag list
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Validity | Level of data where the flag is expected
Flag | Description | Validity
--- | --- | ---
U | N | Automatic quality control
| I | Manual quality control
| R | Backwards propagation of
internal quality control from level 0 data to the minute data

Additional optional flag

**Name** | **Description**
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Questionable | - Manual boolean set when validation of a data can not be made immediately by lack of information.
- Set only on invalid hourly data
- Instrument independent

Data Processing Overview

File transfer
Monitoring site
Automatic processing
Graphical data management
Short term storage
Instrument
Minute aggregation
Minute data
Cycle aggregation
Data products
Long term storage
Instrument
Level 0
Level 1
ATC web site

Level Data description
- Level 0: Raw data (e.g. current, voltages) produced by each instrument
- Level 1: Long term validated data

Processing Detail

- **Raw data**
  - Quality control based on physics parameters
  - Stabilization flagging
  - Humidity correction
  - File transfer
- **In-situ data**
  - Calibration correction
  - Target data
  - Calibration data
  - Filtering
- **Target data**
  - Minute aggregation and standard deviation flagging
  - Cycle aggregation and standard deviation flagging
  - Calibration cycle determination
  - Check valid tank / sequence
- **Injection aggregation**
  - Stabilization
  - Minute aggregation and standard deviation flagging
  - Cycle aggregation and standard deviation flagging
  - Calibration cycle determination
  - Check valid tank / sequence
  - Calibration equation determination
  - Storage

Privacy of the data can not be made immediately by lack of information.

Quality Control Interface: ATCQC

- **Level 0**: Long term validated data
- **Level 1**: Near Real Time (NRT) data (24hr)

Calibration Equation

- Both linear and quadratic equations are computed for all species
- By default the linear equation is used to correct the data
- A linear interpolation of the equations before and after the data is used to correct them
- Tests are ongoing to evaluate the best strategy for interpolation over time

Uncertainties

Daily computation of uncertainties on hourly in-situ data based on short term target:
- Continuous measurement repeatability (CMR)
- Average over 24 hours of the standard deviation of minute short term target means
- Long term repeatability (LTR)
- Standard deviation of the average of injection short term target means over 72 hours

Ongoing work to calculate the measurement bias of the target gas.