



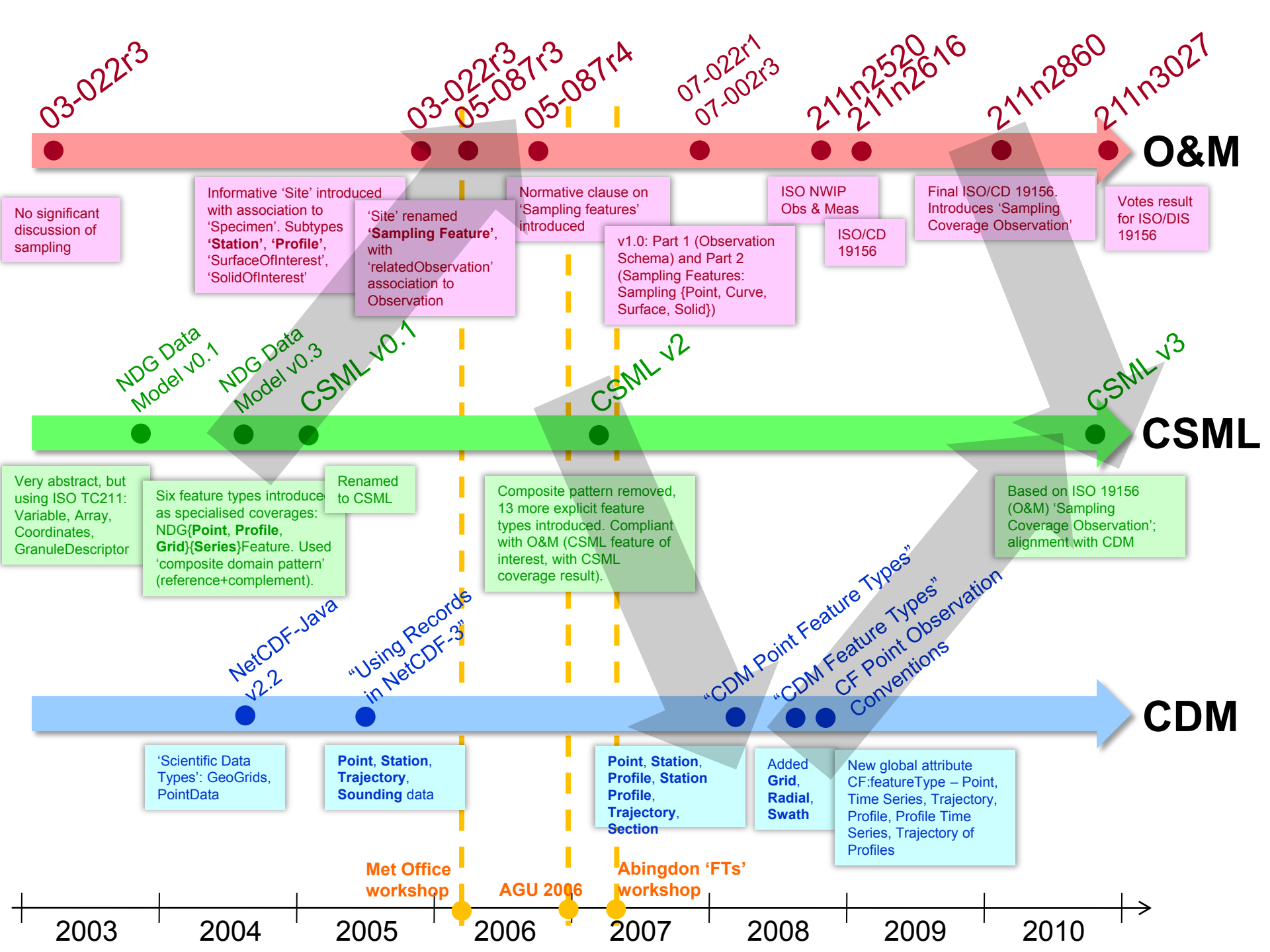
'Sampling Coverage Observations' (aka CSML) for Meteorology

Andrew Woolf, Dominic Lowe
STFC e-Science Centre, BADC
Rutherford Appleton Laboratory

Overview

- History, status, value proposition
- ISO 19156 (Observations and Measurements)
 - Spatial Sampling Features
 - Discrete Coverage Observation
 - Sampling Coverage Observation
- CSML v3





Current status

- ISO/DIS 19156 vote just completed (8-Nov-2010)
 - approved with 100%
- CF point observation conventions and NetCDF Common Data Model
 - fairly stable with respect to identified ‘feature types’
- CSML v3 ‘OGC Best Practice Paper’
 - by December 2010 TC (Sydney)



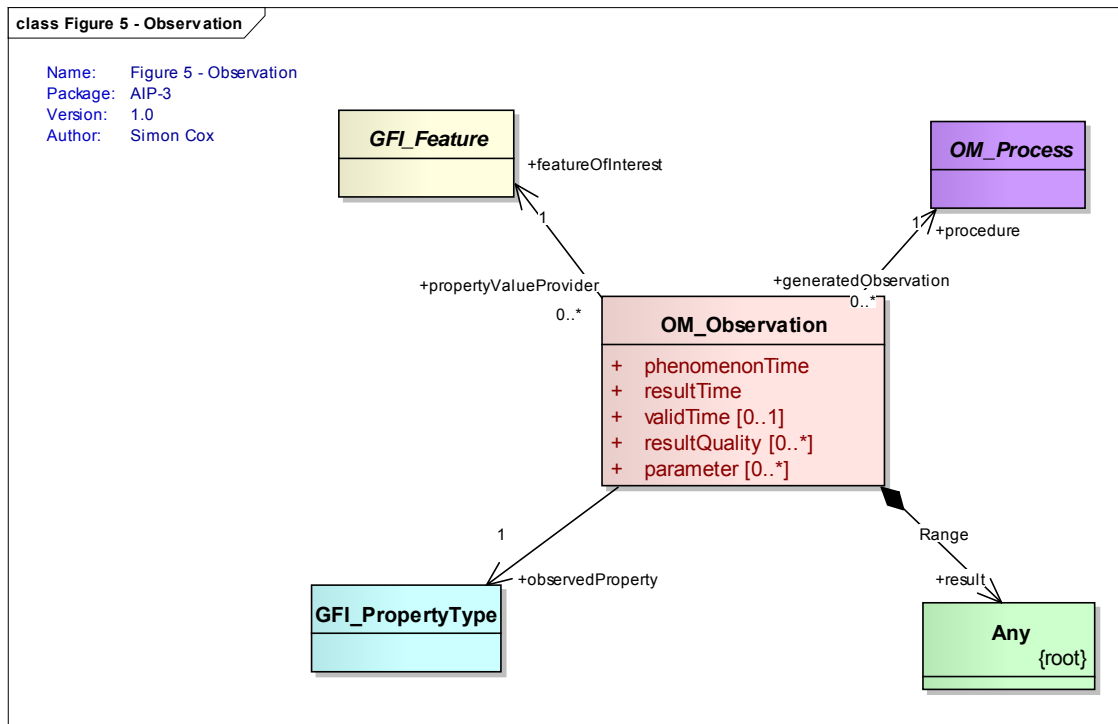
Convergence value proposition

- NetCDF/CF provides widely-used community-governed **encoding format** for observational met/ocean data
- ISO 19156 provides TC211-compatible **conceptual model** for observations
 - growing SWE implementation community
 - ‘SDI-ready’
- CSML provides a bridge between them



ISO/DIS 19156

- Basic Observation model
 - An **observation** is an event that estimates an **observed property** of a **feature of interest**, using a **procedure**, and generating a **result**



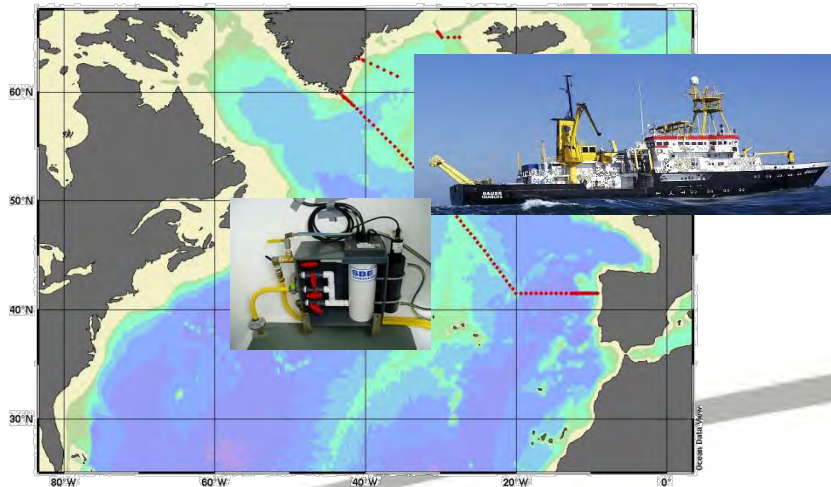
Example: marine observation

O&M

- Feature-of-interest
- observed Property
- Procedure
- result

Marine observation

- Atlantic cruise track
- temperature
- thermosalinograph
- 19.2° C



Example: air quality

O&M

- Feature-of-interest
- observed Property
- Procedure
- result

Air quality

- Urban monitoring station
- CO₂
- FTIR
- 450 ppm

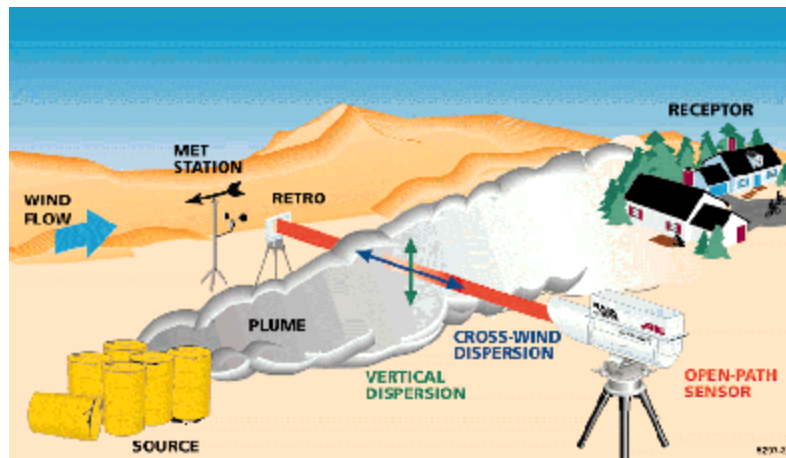


Image courtesy

<http://www.atmosfera.unam.mx>



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Two specialisations

1. Where an observation is *sampling* the environment
 - ‘Sampling Feature’
2. Where the observation result is a *field* (aka ‘coverage’) of discrete values over some spatiotemporal domain
 - ‘Discrete Coverage Observation’



Spatial Sampling Feature

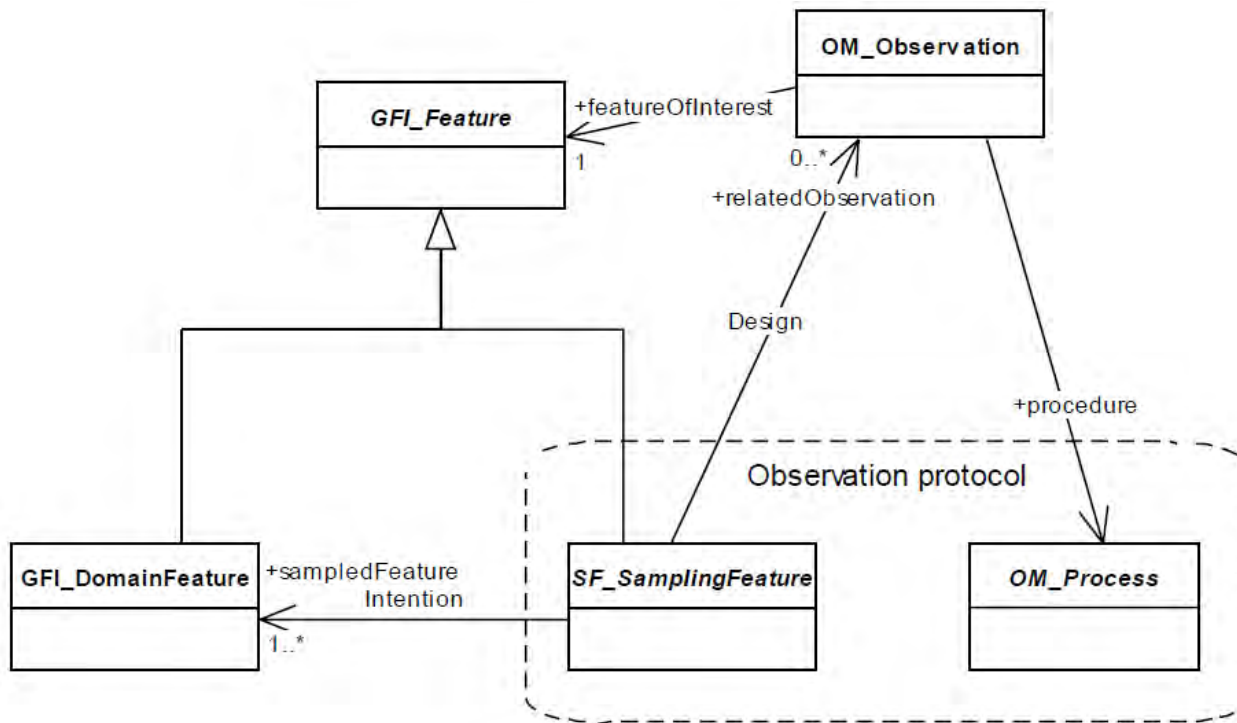
- A radiosonde does not measure temperature of the whole atmosphere, but a *sampling profile* through the atmosphere
- Likewise, a set of CTD casts measures a *sampled section* of salinity through the ocean along a ship's cruise track

“Sampling features are artefacts of an observational strategy, and have no significant function outside of their role in the observation process. ... A sampling feature is intended to sample some feature of interest in an application domain.”
(ISO/DIS 19156 § 8.1.2)



Spatial Sampling Feature

- Defining properties of a Sampling Feature:
 - there is usually one or more **related observations**
 - there is, by definition, a **sampled feature** (e.g. ‘the Ocean’, ‘the Atmosphere’)



Examples of Sampling Features

- Specimen
 - physical sample
- Spatial sampling features
 - Station
 - Profile
 - Section



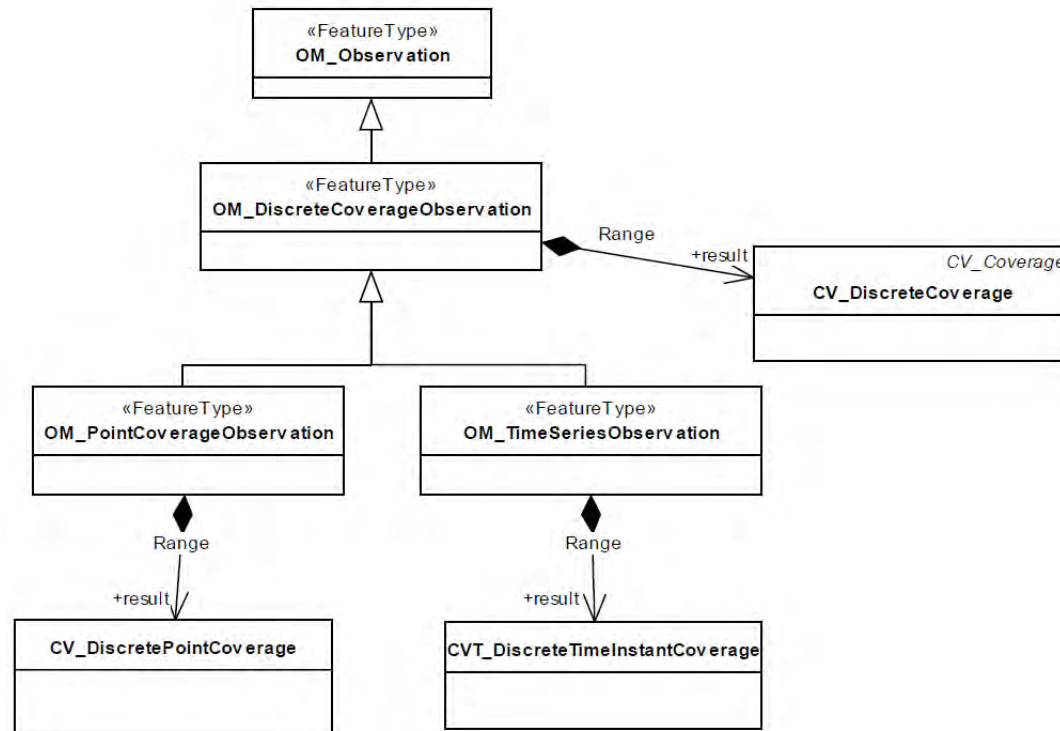
Discrete Coverage Observation

- These are observations of some property which varies over a feature
 - *temperature* varies through the *atmosphere*
 - *salinity* varies within the *ocean*
- The result of the observation will also be a function
- Different to e.g.:
 - measuring the *mass* of a *banana*
 - or the *height* of a *tree*



Discrete Coverage Observation

- Important subtypes
 - Time-series at a point
 - Set of discrete points at a time



Bringing it together

- In ***most*** observational cases of interest in met/ocean, we:
 - ***sample*** some property (in time and/or space)
 - with a result which ***varies*** over the sampling domain
- Thus we need a ***Sampling Coverage Observation***

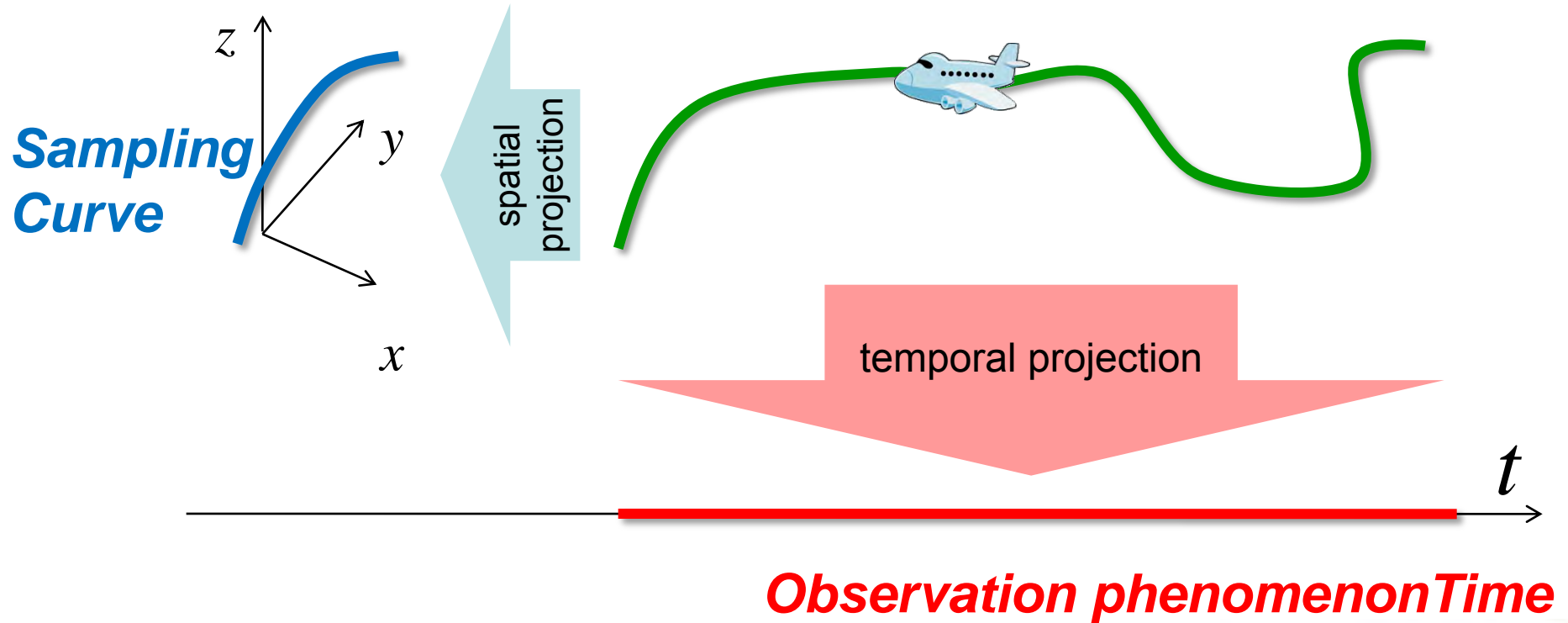


Sampling Coverage Observation

- Definition:
 - Observation *feature-of-interest* is a *Spatial Sampling Feature*
 - Observation *result* is a *coverage*
- Consistency constraints:
 - *observed property* is consistent with *range type* of (coverage) result
 - *shape* of sampling feature contains *spatial elements* of coverage domain
 - Observation *phenomenon time* contains *temporal elements* of coverage domain



Sampling Coverage Observation



CSML v3

- We need to specialise this general pattern for specific cases of interest
- This is the basis of CSML v3
- Aim is convergence with CDM



CSML v3

CSML	CF/CDM
Point	Point
PointSeries	StationTimeSeries
Trajectory	Trajectory
Profile	Profile
ProfileSeries	StationProfile

CSML	CF/CDM
Swath	Swath
ScanningRadar	StationaryRadialSweep
Section	Collection of Profiles
Grid	Grid (single time)
GridSeries	Grid

Profile	
based on	SF_SamplingCurve
phenomenonTime	TM_Instant
coverage result	CV_DiscreteGridPointCoverage
grid dimension	one
external CRS	four (x-y-z-t)
alignment	z-axis



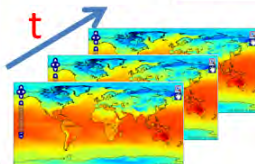
An observation of some parameter along a vertical line in space. E.g. Wind sounding or radiosonde.

PointSeries	
based on	SF_SamplingPoint
phenomenonTime	TM_Period
coverage result	CVT_DiscreteTimeInstantCoverage



A time-series of single datum observations at a fixed location. E.g. Tidegauge, buoy, weather station

GridSeries	
based on	SF_SamplingSolid
phenomenonTime	TM_Period
coverage result	CV_DiscreteGridPointCoverage
grid dimension	four
external CRS	four (x-y-z-t)
alignment	-



Time-series of gridded parameter fields. E.g. Numerical weather prediction model

ProfileSeries	
based on	SF_SamplingCurve
phenomenonTime	TM_Period
coverage result	CV_DiscreteGridPointCoverage
grid dimension	two
external CRS	four (x-y-z-t)
alignment	z-, t- axes



Time-series of profiles on fixed vertical levels at a fixed location. E.g. vertical radar timeseries

CSML v3

- Next steps:
 - Best Practice paper for discussion by December OGC TC (Sydney)
 - Under governance of MO.DWG
 - Re-use and extension for specialised applications





Questions?