The MSC GeoMet Platform

A Mission Critical Standards-based Geospatial Web API platform for Weather, Climate and Water data

Tom Kralidis
National Prediction Development
Canadian Centre for Meteorological and Environmental Prediction
Meteorological Service of Canada
Environment and Climate Change Canada

Workshop:
Weather and climate in the cloud

ECMWF

Overview

- Context/Drivers
- MSC GeoMet Platform Overview
- Roadmap

Rationale/Context

Weather Data is Geospatial

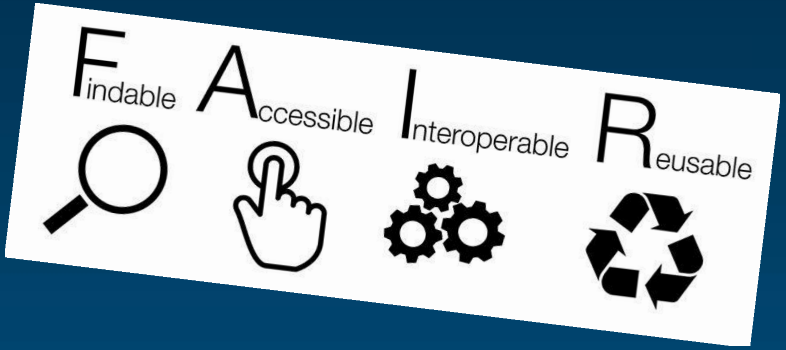
- Real-time, Archived
- Voluminous and **growing** (TBs per day)
- Temporal
- Continuous

Rationale/Context

Key Drivers

- **→ Low Barrier ←**
- SpatioTemporal data integration from multiple distributed sources
- Decision Support Systems: Discovery, Access, Visualization, Processing
  - Providing maps, features, coverages
    - Timely, Authoritative, Performant
    - Plug and Play
- Model and observation comparison
  - Ingesting international data
- Analytics, Key Performance Indicators (KPIs)
  - BI tools integration

Rationale/Context

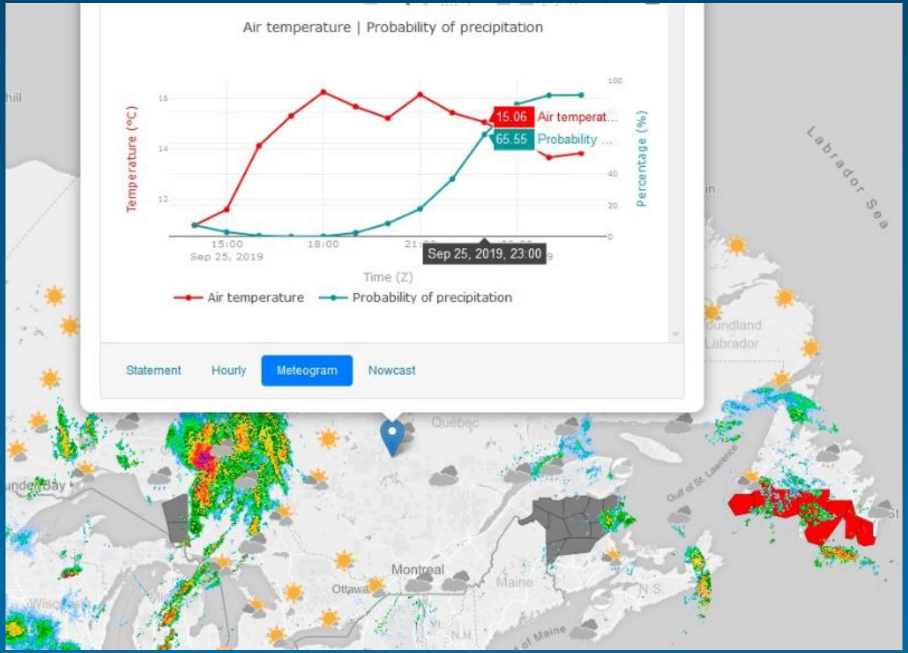


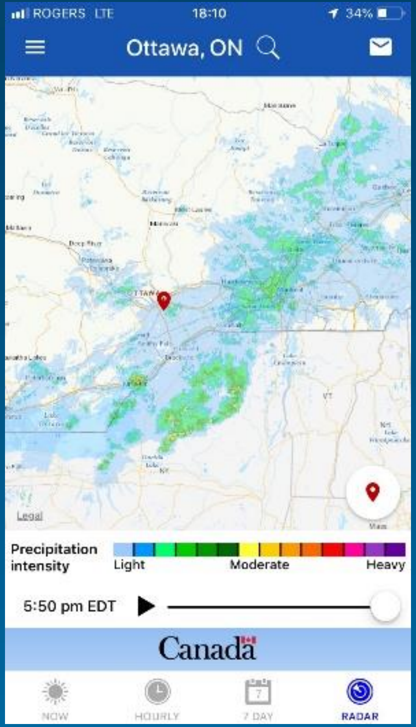
Key Drivers

- Services
  - Websites
  - Machine access (push, pull)
- Open Government / Open Data
  - Findable, Accessible, Interoperable, Reusable (FAIR)
- Canadian / Federal Geospatial Platform
- World Meteorological Organization
- Mass Market (Google, Microsoft, etc.)

MSC's OGC API Platform for Weather, Climate and Water

- Mission critical 24/7 OGC API providing public access
- Interoperable: access and directly integrate weather data into web applications, mobile apps and specialized tools
- 7,000 time-enabled real-time and archive weather/climate/water layers
  - North-American weather radar
  - High resolution local, regional and global forecast models
- Enabling functionality:
  - Discovery
  - Access
  - Visualization
  - Processing

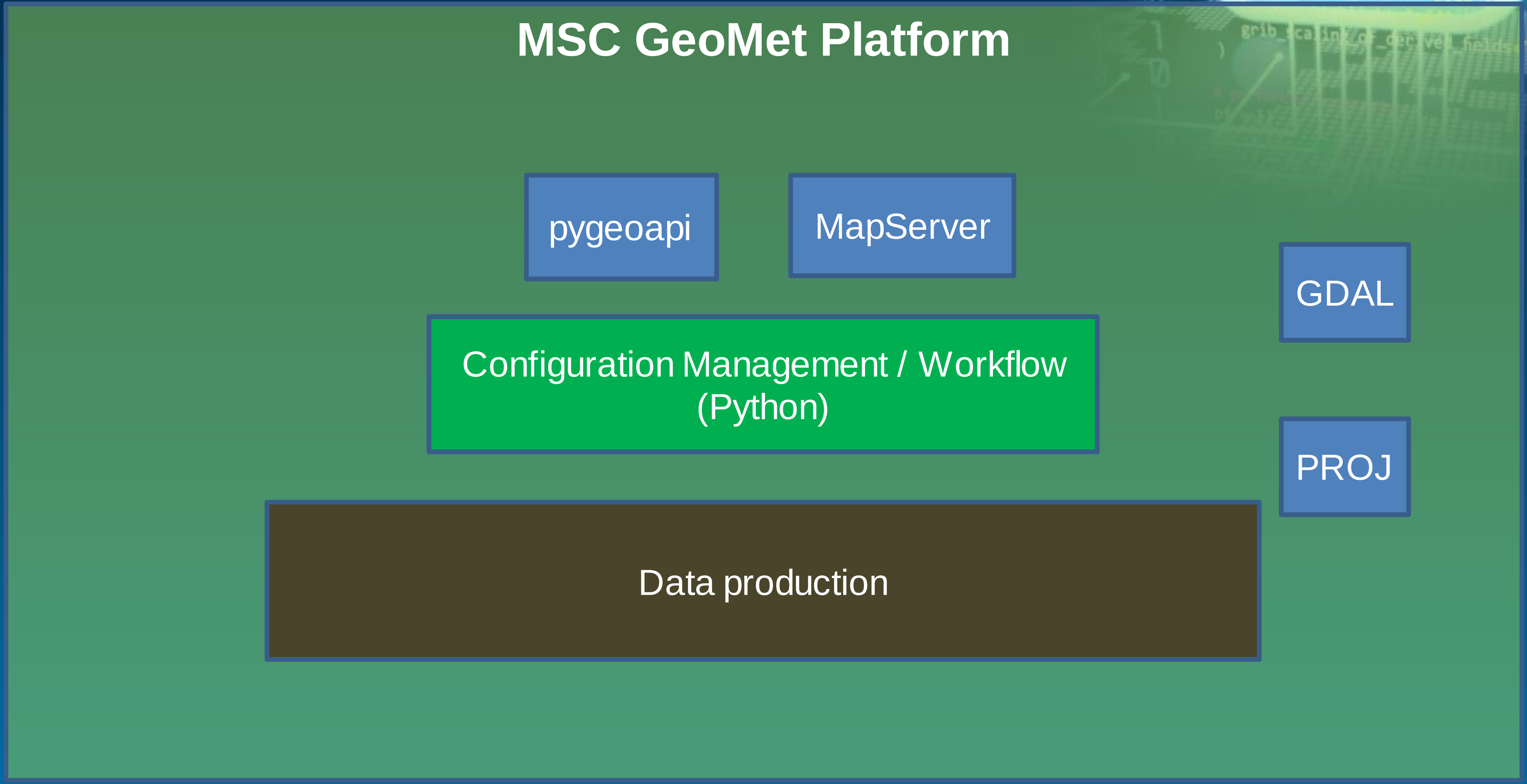




MSC GeoMet

- Standards-based
  - OGC WMS
  - OGC WCS
  - OGC API – Features
  - OGC API – Processes
  - STAC
- Grounded in best practices
  - Open Standards (OGC/ISO/W3C)
  - Open Source
  - Agile development methodology
    - Continuous integration / deployment
  - Release management
  - User Support
- 10 million hits / data requests daily

Core Technology Stack



Collaborative Technology Choices

- Open Standards
  - Interoperability, Plug and Play
- Open Source
  - Government of Canada policy instruments
  - Collaboration (leveraging external investments, **giving back**)
  - MSC funds core OSS as required
  - Corporate knowledge
- Python
  - Lightweight/minimal footprint/setup
  - Easy to read and understand, fast to develop applications
  - **The lingua franca programming language in scientific/geospatial/data science**
  - Fast (enough), easy integration with high performing low level libraries and languages (C/C++)

Roadmap: Initiatives and Trends

- Increased focus on user-centered data / service provisioning
- Data science/analysis: **reproducible workflows** with common tooling
- On-demand weather data **processing**: dynamic calculation/extraction/analysis of weather/climate/water data
- **Cloud**: GoC cloud-first initiative
- Bring the user to the data: processing data in-situ (no download)
- Analysis ready data (**ARD**): data preparation in support of providing lower barrier to entry for data scientists and research communities
- **More data**: increase in weather modeling resolution, data frequency (hourly/minutely)
- Mass market: linked data and **Search Engine Optimization** (SEO) support are paramount to lowering the barrier to ECCC data ("the browser search is the catalogue")
- **Standards** evolution: mass market drivers are resulting in new **API** standards
- **WIS 2.0**: Web Services

Emerging API Standards Implementation

OGC API

- Clean break from traditional web service API standards
- Service-oriented => Resource-oriented
- REST/JSON/OpenAPI
- “webby”
- “of the web”

OGC API Modernization

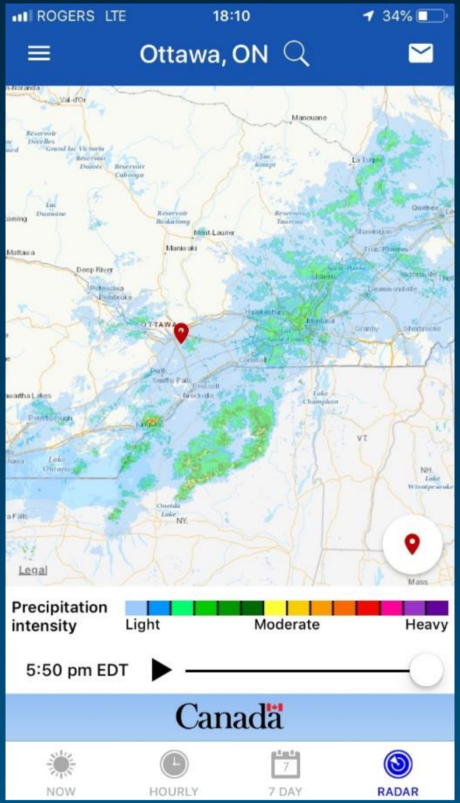
Standard	Emerging OGC API	Purpose	Output
OGC WMS	OGC API – Maps	Visualization	Maps
OGC WMTS	OGC API – Tiles	Acceleration	Cached Maps/Data
OGC WFS	OGC API – Features	Access	Features
OGC WCS	OGC API – Coverages	Access	Coverages
OGC WPS	OGC API – Processes	Processing	*
OGC CSW	OGC API – Records	Discovery	Metadata
	OGC EDR API	Discovery, Access	“Data”

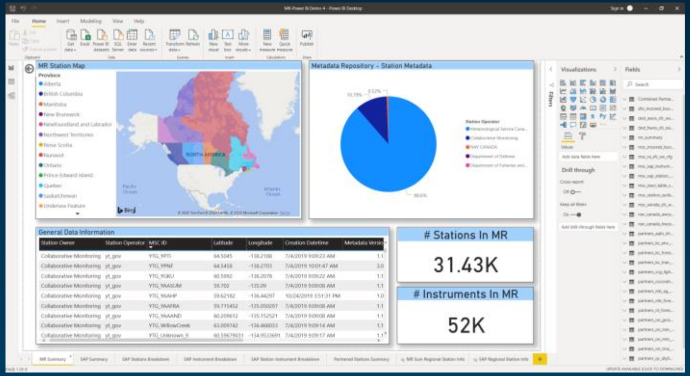
MSC GeoMet Roadmap

- Complete implementation of OGC API standards
  - OGC API – Coverages
  - OGC API – Processes
  - OGC API – Maps / OGC API - Styles
  - OGC API – Records
  - OGC EDR API
- Cloud native deploy (Azure)
  - Object storage, serverless
- Secured services (authentication and authorization)
- Performance improvements (temporal caching) against popular datasets
  - MapProxy WMS Time enhancements
- Increasing access metrics as a driver to provisioning
- Implement analysis ready data (ARD) / data cube functionality with multidimensional data processing and extract support
  - Xarray, Zarr

OGC MetOceanDWG Collaboration

- MSC, NOAA/NWS, UK MetOffice working on EDR API server implementation in pygeoapi
  - Dedicated sprints in February 2020
  - Core server implementation
  - Community plugins (EDR, Processing, etc.)
    - https://github.com/OGCMetOceanDWG/metocean-pygeoapi
- OGC EDR API / API Records work to create MetOcean Best Practice for OGC API – Records
  - Discovery, metadata extensions (WIS 2.0)
    - https://github.com/OGCMetOceanDWG/ogcapi-records-metocean-bp
- EDR integration with other OGC APIs (OGC API – Processes)
- pygeoapi: Python OGC API Server
  - OGC Reference Implementation
  - Extensible (core + plugin framework)
    - https://pygeoapi.io





General Data Information

Station Owner	Station Operator	MSC ID	Latitude	Longitude	Creation Datetime	Metadata Versio
Collaborative Monitoring	yt_gov	YTG_YPTI	64.5045	-138.2188	7/4/2019 9:09:23 AM	1.1
Collaborative Monitoring	yt_gov	YTG_YPNF	64.5458	-138.2703	7/4/2019 10:01:47 AM	3.0
Collaborative Monitoring	yt_gov	YTG_YGKU	60.5992	-136.2078	7/4/2019 9:09:22 AM	1.1
Collaborative Monitoring	yt_gov	YTG_YAASUM	59.702	-135.09	7/4/2019 9:09:08 AM	1.1
Collaborative Monitoring	yt_gov	YTG_YAAHP	59.62182	-136.44297	10/24/2019 3:51:31 PM	1.0
Collaborative Monitoring	yt_gov	YTG_YAAFRA	59.715452	-135.050297	7/4/2019 9:09:08 AM	1.1
Collaborative Monitoring	yt_gov	YTG_YAAAND	60.209612	-135.152521	7/4/2019 9:09:08 AM	1.1
Collaborative Monitoring	yt_gov	YTG_WillowCreek	63.009742	-136.468033	7/4/2019 9:09:14 AM	1.1
Collaborative Monitoring	yt_gov	YTG_Unknown_9	60.59679031	-134.9533691	7/4/2019 9:09:17 AM	1.1

# Stations In MR

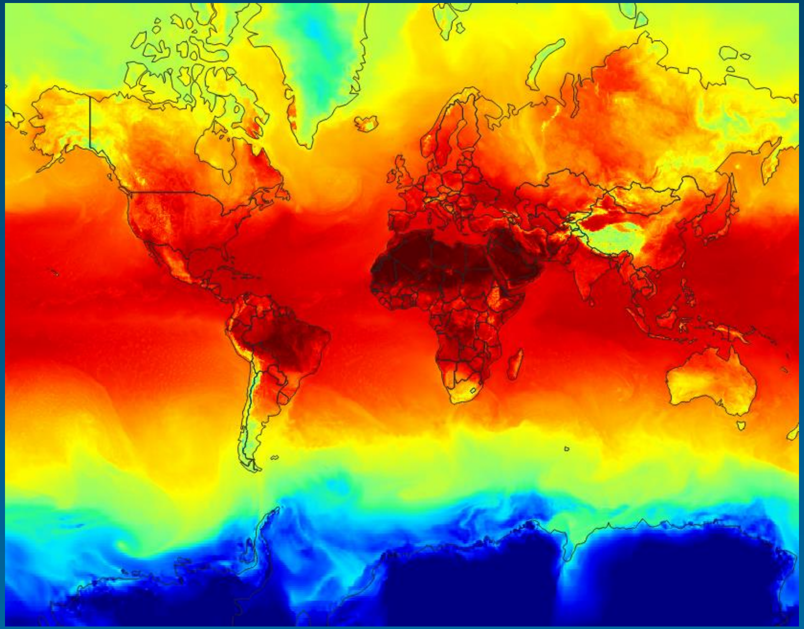
31.43K

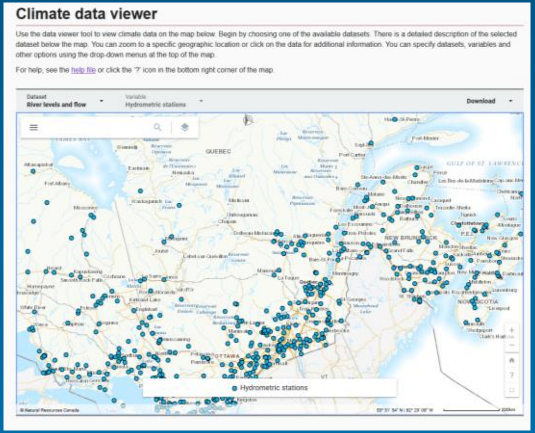
# Instruments In MR

52K

https://eccc-msc.github.io/open-data

@tomkralidis





Climate data viewer

Use the data viewer tool to view climate data on the map below. Begin by choosing one of the available datasets. There is a detailed description of the selected dataset below the map. You can zoom to a specific geographic location or click on the data for additional information. You can specify datasets, variables and other options using the drop-down menus at the top of the map.

For help, see the help file or click the '?' icon in the bottom right corner of the map.

Dataset: River levels and flow
Variable: Hydrometric stations
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