EXTRA – Examples of OGC standards in support of health applications

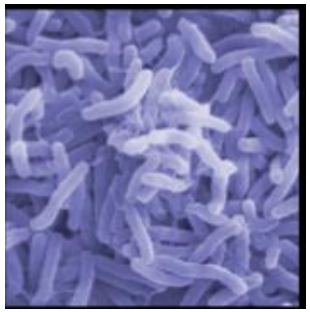
Some prior / existing initiatives using OGC Standards

- EU INSPIRE (health and safety working group)
- GEOSS AIP, EO2Heaven project: EO2HEAVEN (Earth Observation and Environmental Modelling for the Mitigation of Health Risks) is a research project co-funded by the European Commission as part of the 7th Framework Programme (FP7) Environmental theme. It started on 1st February 2010. EO2HEAVEN contributes to a better understanding of the complex relationships between environmental changes and their impact on human health.
- Medical Biology / Neuroscience, University of San Diego
- Prior GeoConnections funded projects (25+)
- Other OGC DWGs (cross-pollination)

Health Case Studies for GEOSS

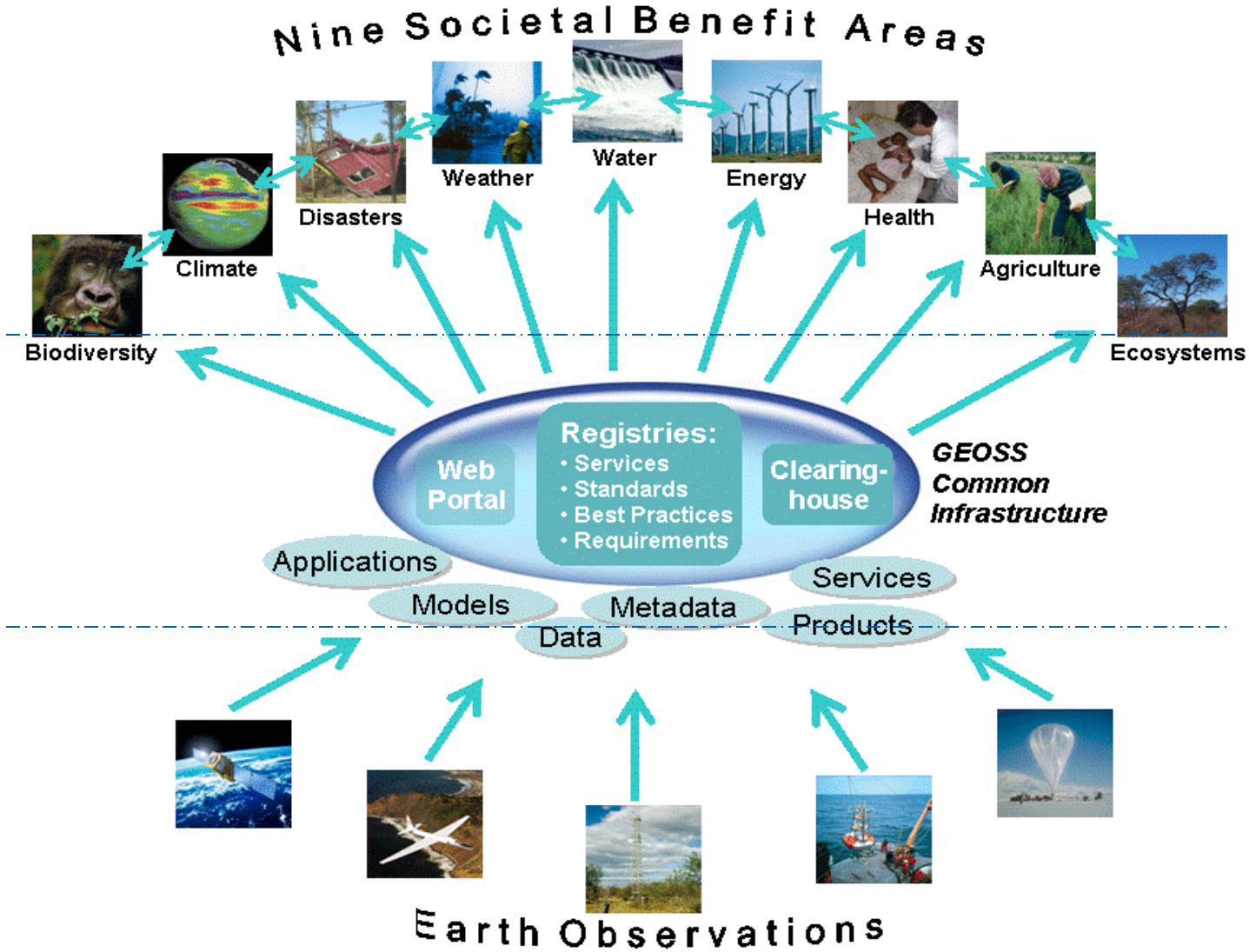
Environmental effects on allergies and cardiovascular diseases in Dresden and the Free State of Saxony, Germany

Environmental challenges to health in South Durban, South Africa, due due to human exposure on atmospheric pollution

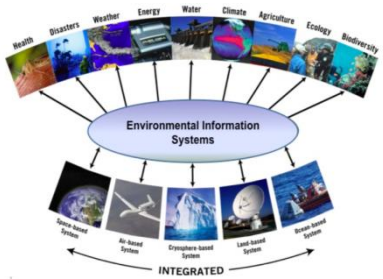


Investigating the impact of environmental and climatic variables on the cholera outbreaks in Uganda

GEOSS connects Observations to Decisions



GEOSS AIP Architecture



Community Objectives

Enterprise Viewpoint

GEOSS Vision and Targets
Societal Benefit Areas
System of Systems/ Interoperability

Abstract/Best Practices

Information Framework

Earth Observations
Geographic Features
Spatial Referencing
Metadata and Quality
GEOSS Data-CORE

Information Viewpoint

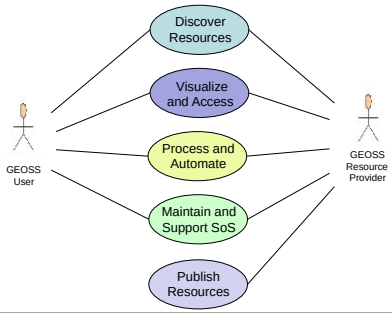
Computational Viewpoint

Services

Catalog/Registry
Access and Order
Processing Services
Sensor Web
User Identity

Optimized Design/Development

Use Cases

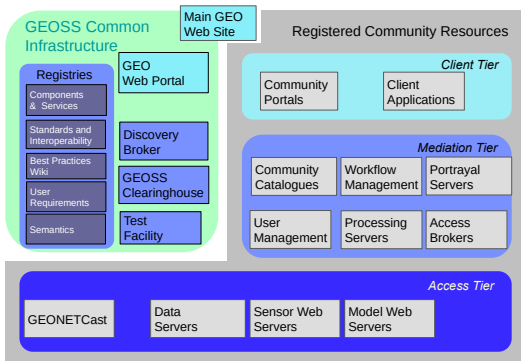


Tutorials

Engineering Viewpoint

Technology Viewpoint

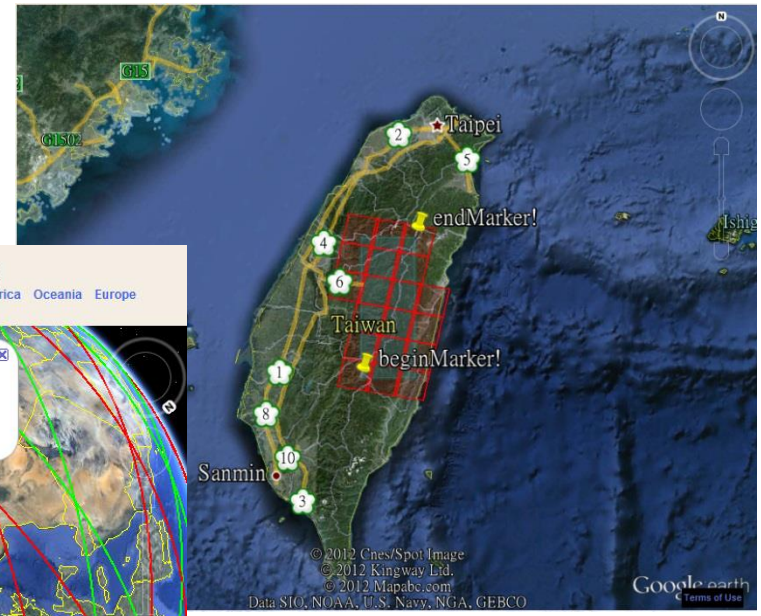
Component Types

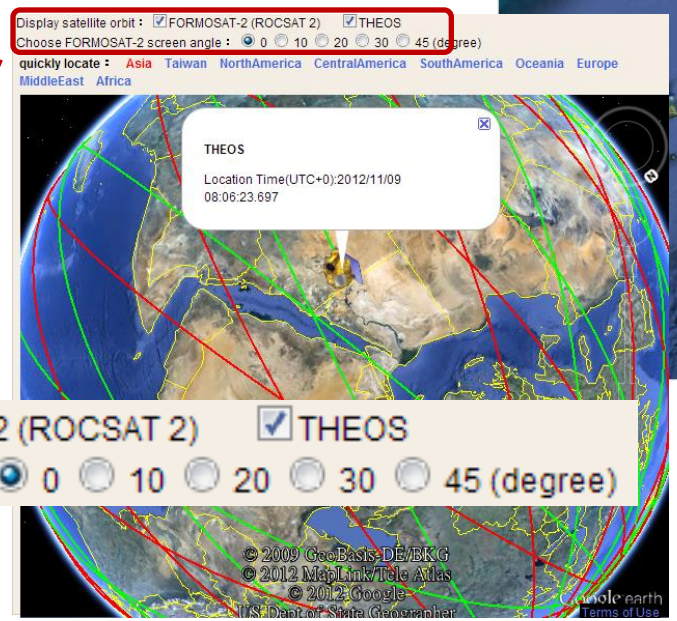


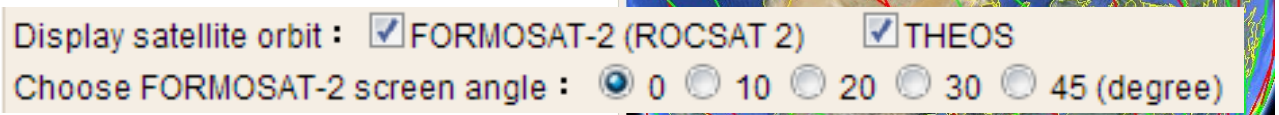
RM-ODP Viewpoints

AIP: Disaster Management

User Interface





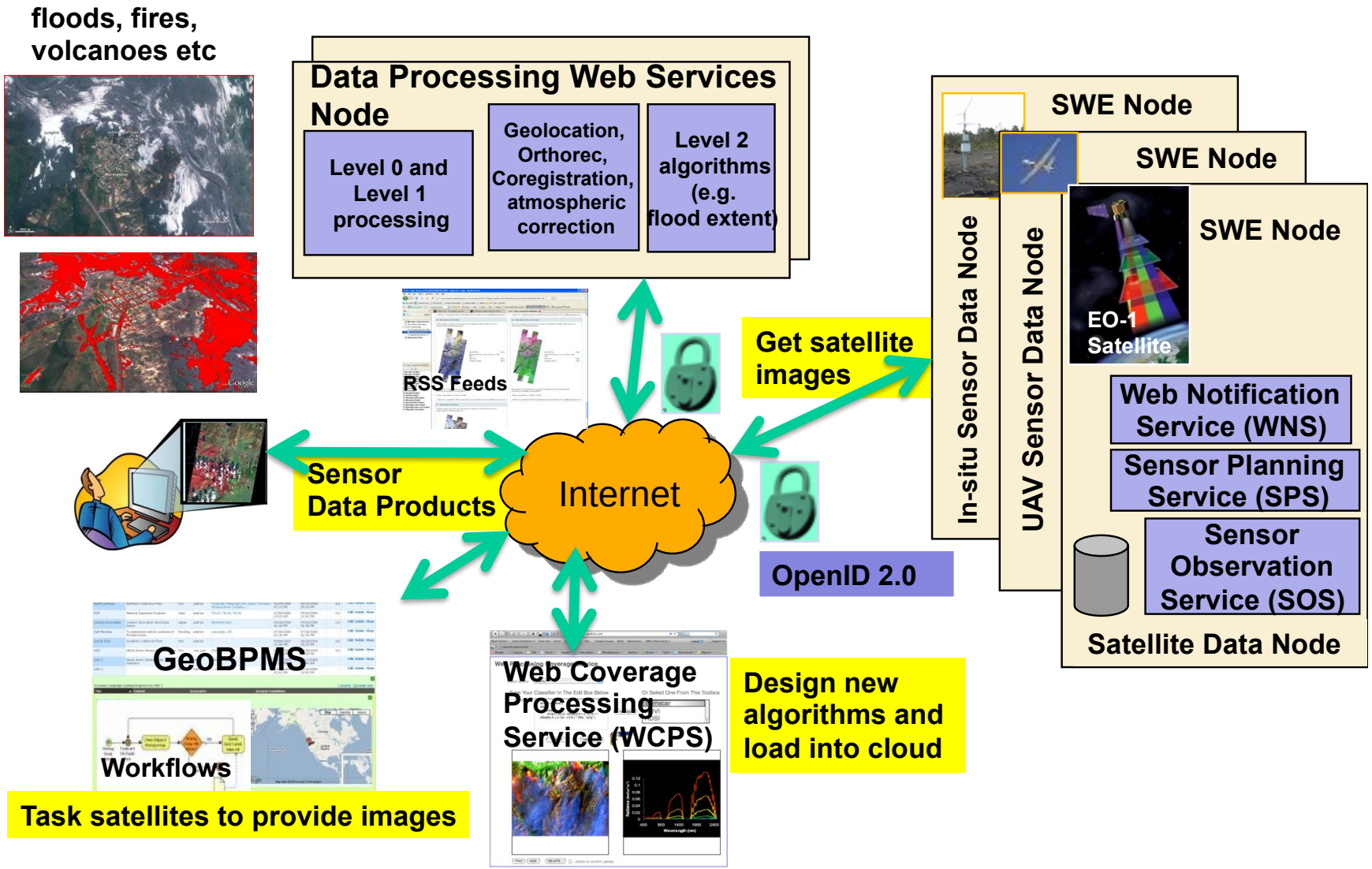


http://140.134.48.12:443/quasiST/login

AIP: Disaster Management

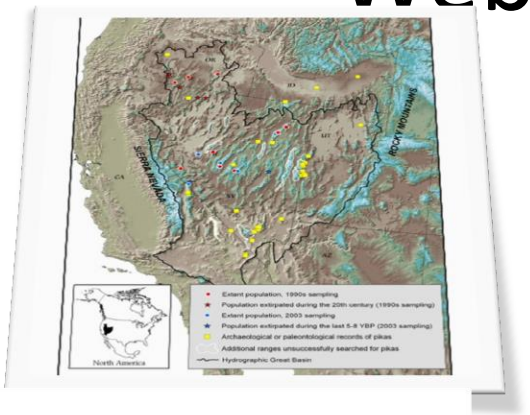
SensorWeb High Level Architecture

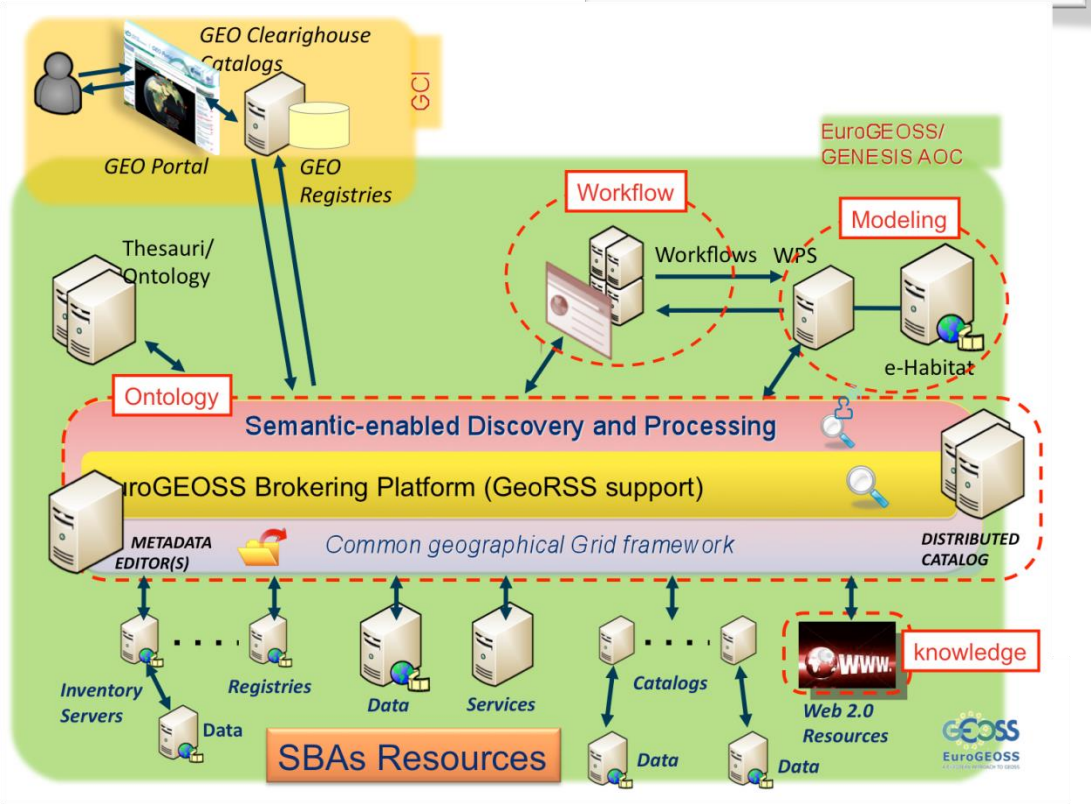
Sensors, Algorithms and Models Wrapped in Web Services Provide Easy Access to Sensor Data and Sensor Data Products



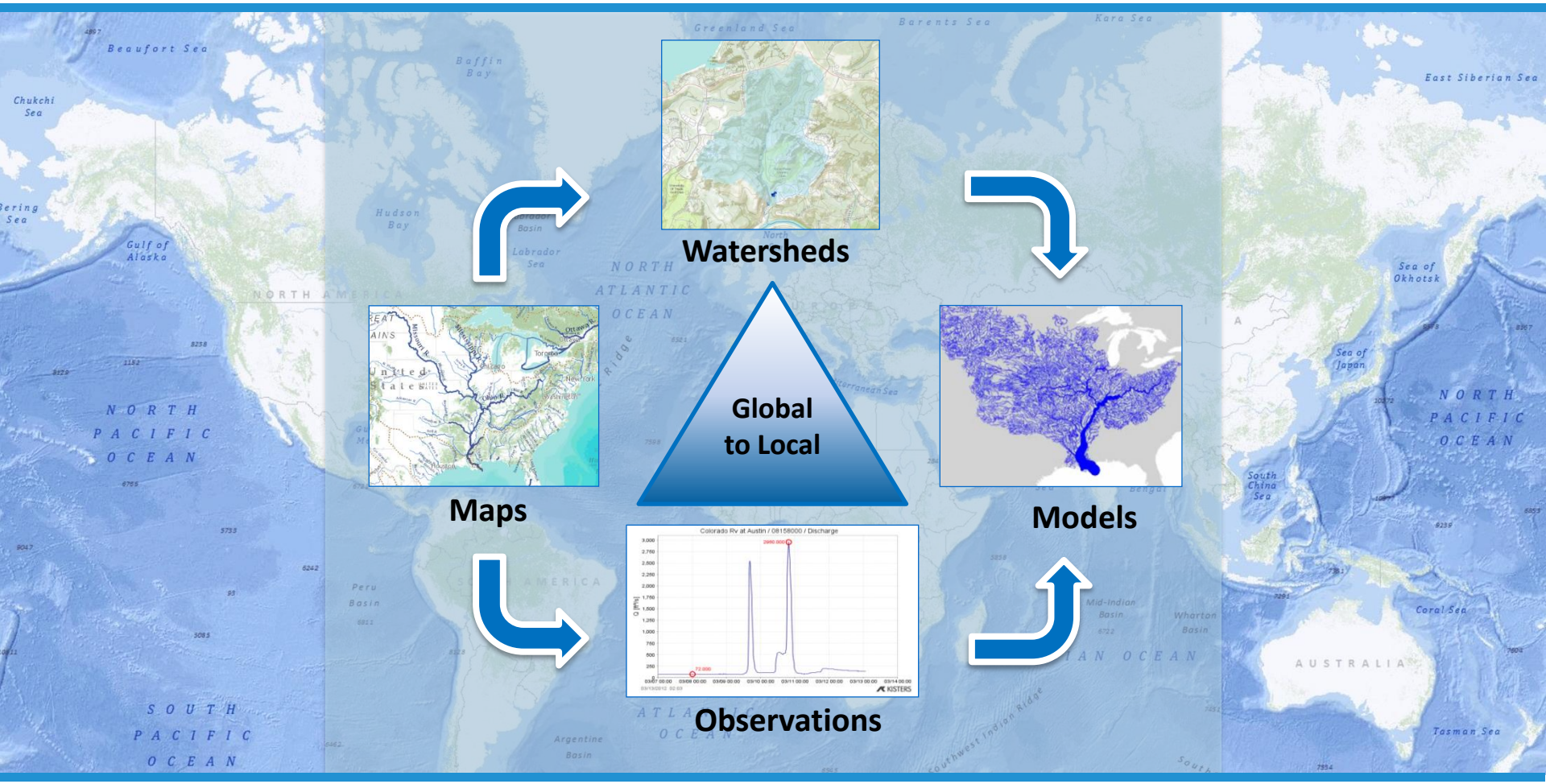
AIP: Biodiversity models on Web

- Observations plus modeling systems to predict pika distributions change with climate
- Interoperability to determine predictors for the impact of climate change on biodiversity





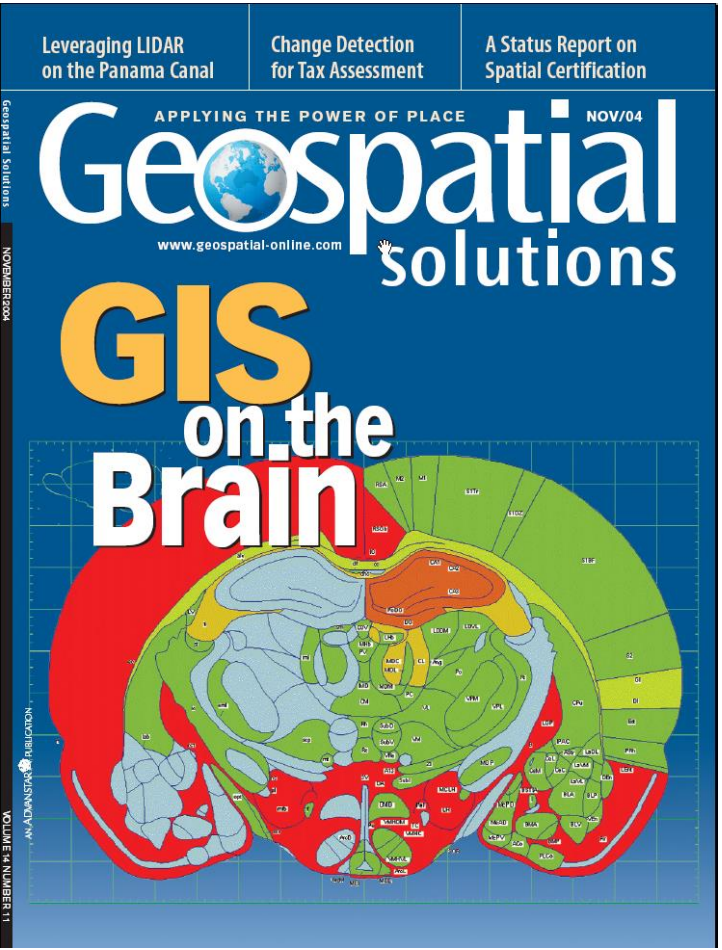
AIP-6: Hydrology on the web



World Water Online – Univ Texas Austin.

Leadership in AIP-6 along with many participants

Integrating digital atlases of the brain: atlas services with WPS



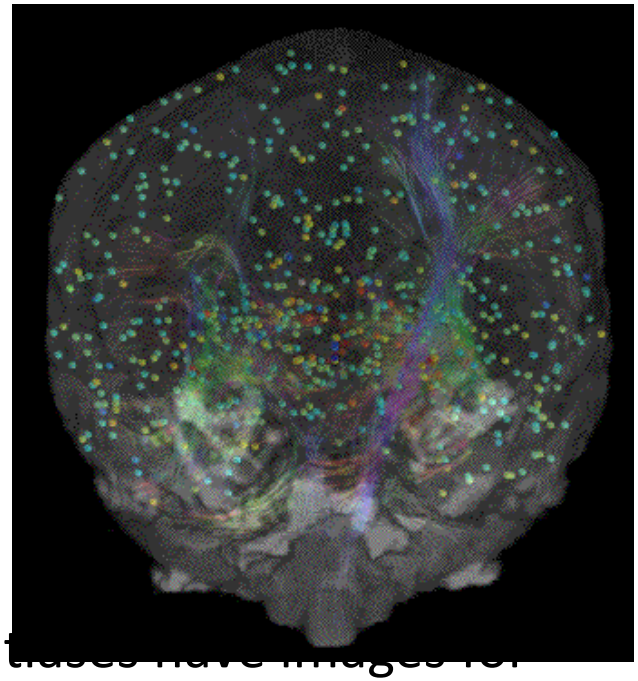
Ilya Zaslavsky

San Diego Supercomputer Center, UCSD

Lead of the INCF
Digital Atlasing Infrastructure Task Force

What is an atlas?

- A collection of 2D images or a 3D volume, possibly with anatomic feature delineations and a set of additional annotations



What we need is more than an atlas:

- A gateway to large distributed databases of images, volumes, segmentations, gene expression data, electrophysiology, behavioral, connectivity, other spatially-registered data
  - Ability to ask questions such as "which atlases have images for this part of the brain", "what genes are expressed here in atlas A", "compare spatial patterns of protein distribution across atlases", etc.
- Collection of atlases organized as spatial data sources
- Collection of spatial data registries, service APIs and workflows:
  - image registration, segmentation, spatial selection, spatial analysis, integration of spatial data
- Collection of viewers, integration and annotation tools

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http://incf.org/

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INCF is an international organization devoted to advancing the field of neuroinformatics

4th INCF Congress of Neuroinformatics
Boston, USA | Sept 4 - 6

incf Neuroinformatics 2011

for their contributions

e, Japan. This year's

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PEOPLE

"Data is king."
Name: Mark Ellisman
Research Area: General neuroinformatics
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SUB NAVIGATION

- Multi-Scale Modeling
- Digital Brain Atlasing
  - Projects
  - Activities
  - People
- Ontologies of Neural Structures
- Standards for Datasharing

Digital Brain Atlasing

Digital brain atlases are essential tools in neuroscience research. They function as references and analytical tools, and provide stable integration frameworks as a basis for investigations of normal and abnormal brain structure and function. Web-accessible brain atlases and spatial indices promise to evolve into powerful tools for dynamic, multidimensional modes of scientific interaction. The key aim of this INCF program is to coordinate and improve the impact of atlasing projects, with a focus on the rodent brain.

Reference Data - Waxholm Space

Waxholm Space is a coordinate-based reference space for the mapping and registration of neuroanatomical data in the mouse brain. Image volumes representing the canonical Waxholm Space (WHS) mouse brain can be downloaded from the INCF Software Center. Servers hosting the Waxholm Space translation services, which will enable scientists to register their own mouse data to the standard Waxholm Space coordinates as well as provide translations among other mouse brain atlases, have been set up the Royal Institute of Technology's Supercomputer Center in Stockholm.

People

View all People

Oversight Committee Chair

Robert W. Williams

Waxholm Space Task Force

Mike Hawrylycz

Digital Atlasing Infrastructure Task Force

Ilya Zaslavsky

Project coordinator

Jyl Boline

PROJECTS

- Waxholm Space
- Allen Brain Atlas mirror site
- Standards and Guidelines for Digital Brain Atlasing

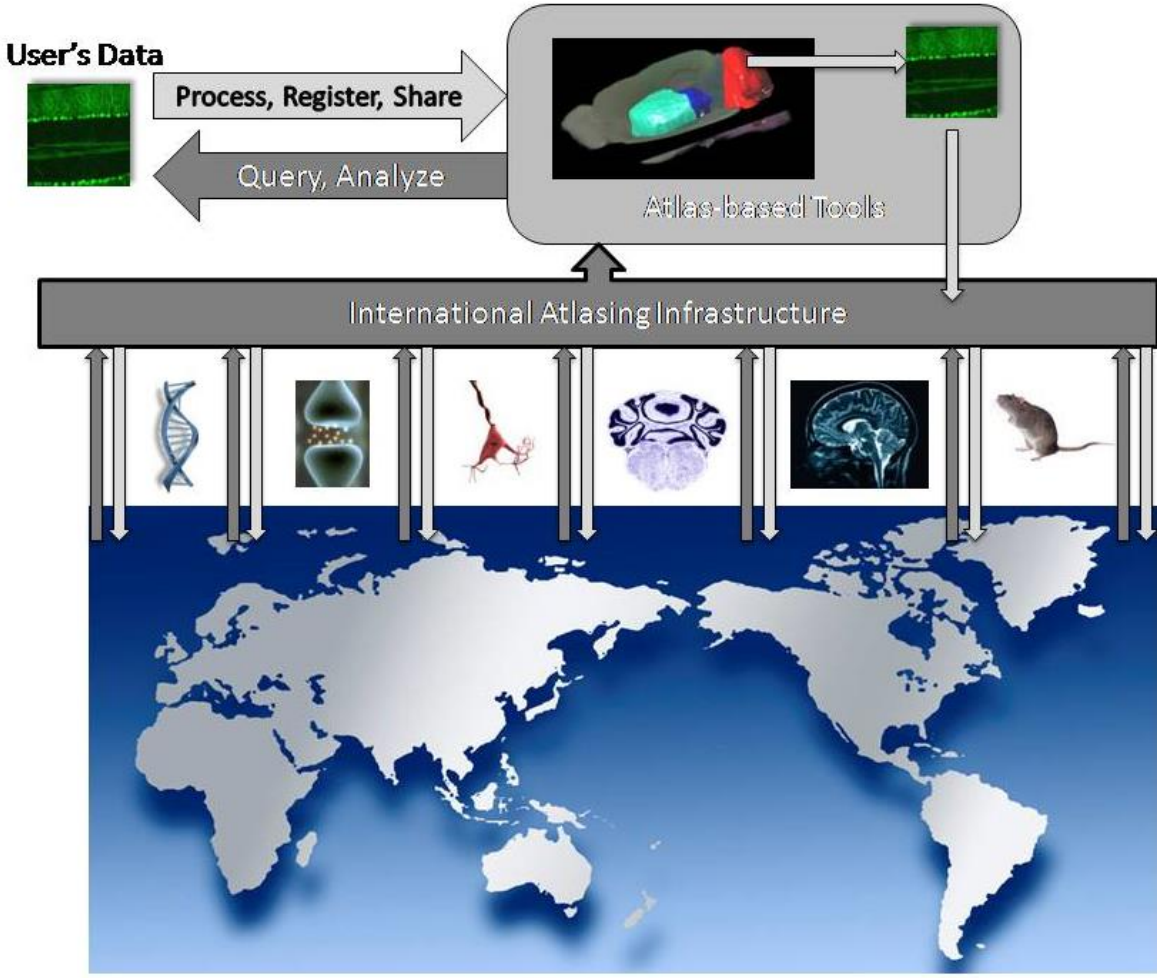
DOCUMENTS

- Report on Digital Atlasing Standards in the Rodent Brain (Waxholm Space) (2009) pdf
- Workshop Report on Mouse and Rat Brain Digital Atlasing Systems pdf, also available from *Nature Precedings* (2007)

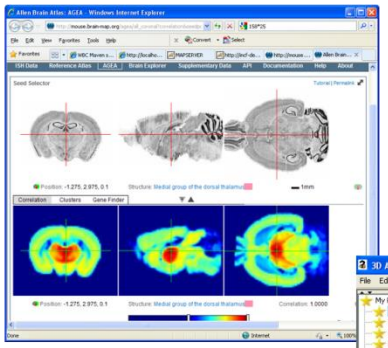
CONTACT DETAILS

Janis Breeze
janis.breeze@incf.org

Purpose of this INCF program: To enhance the interoperability, accessibility, and sharing of spatial data sets in neuroscience: INCF-sponsored standards

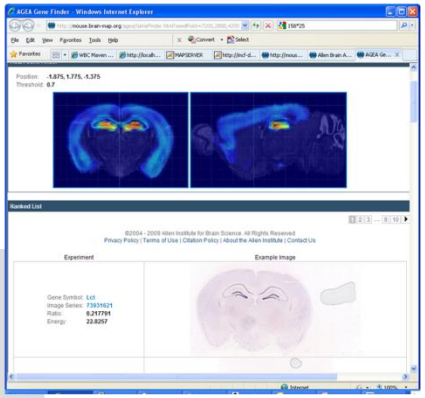


Accessing atlases from the Whole Brain Catalog

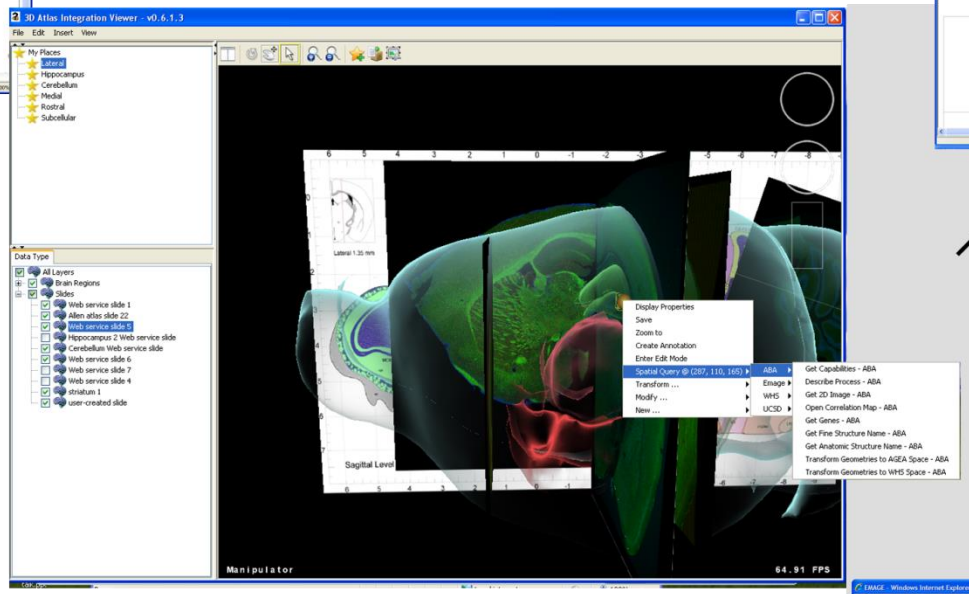


AGEA response to GetCorrelationMapByPOI

GetGenesByPOI returns gene information from AGEA

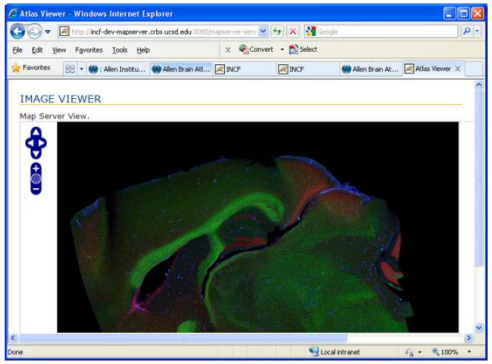


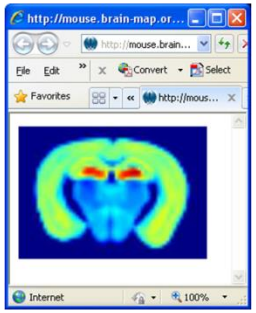
The 3D atlas integration client



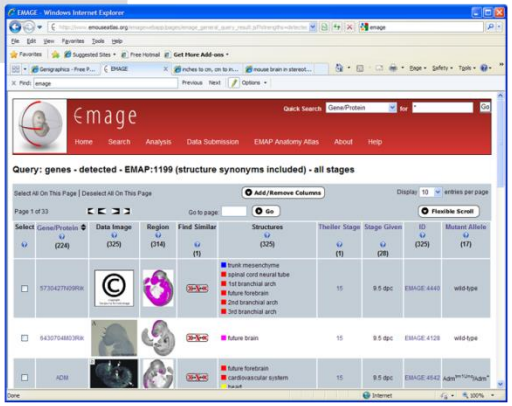
GetGenesByStructureName returns gene information from EMAGE

Get2DImageByPOI returns related images from UCSD hub

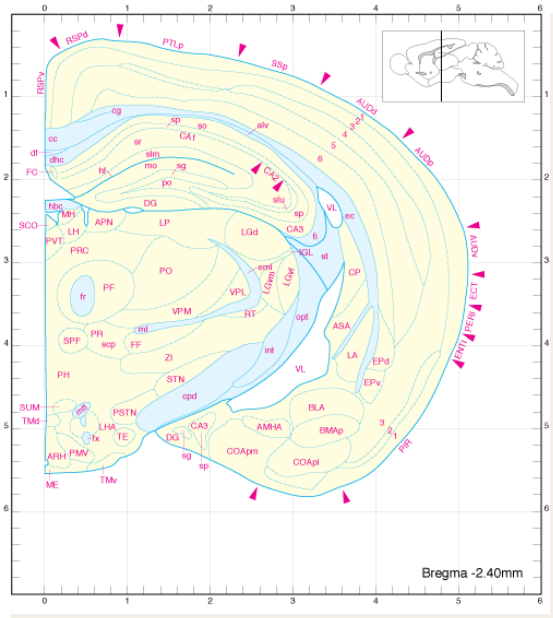


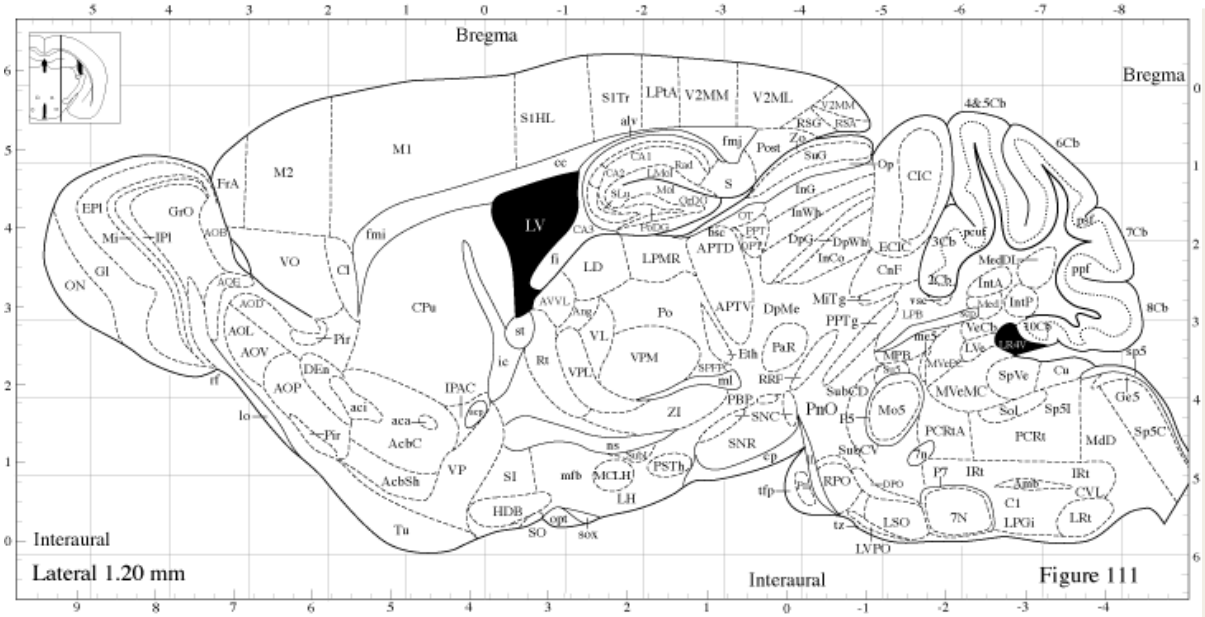


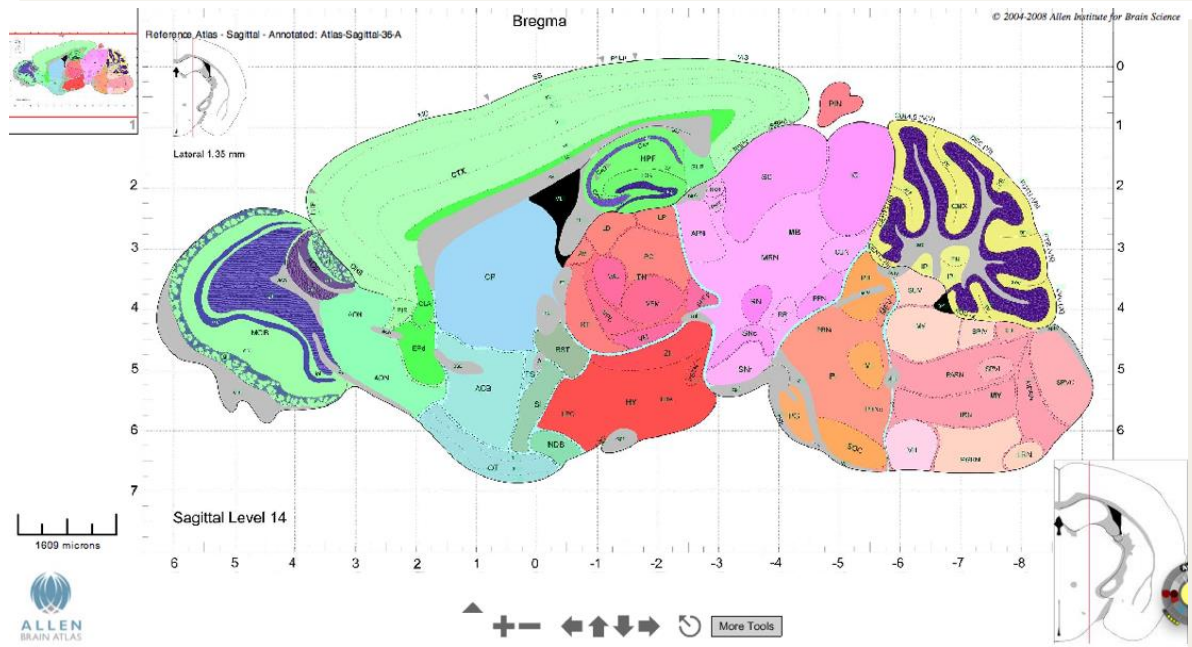
Get2DImageByPOI returns images from AGEA

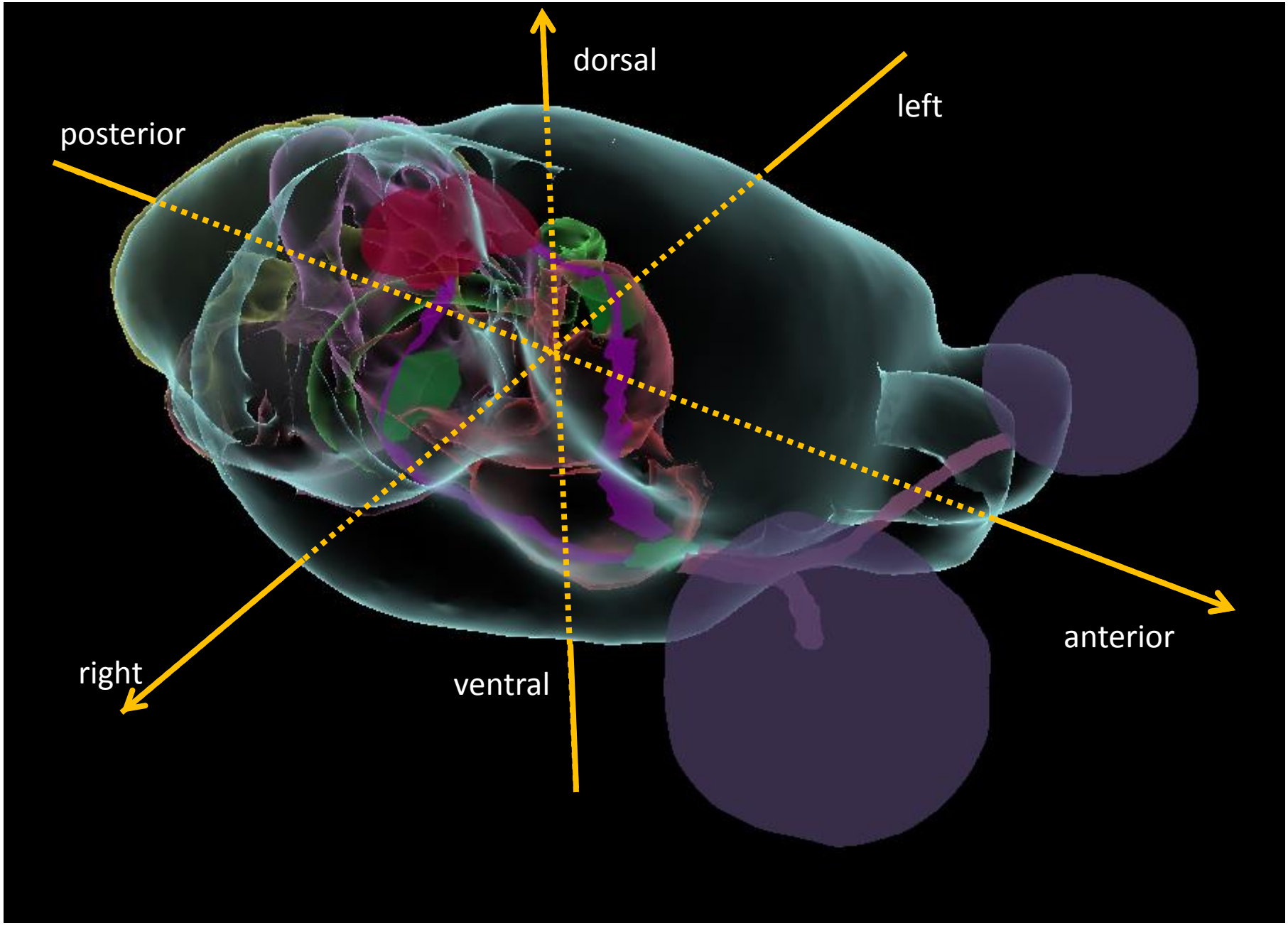


The Integration Problem: Whose standard?

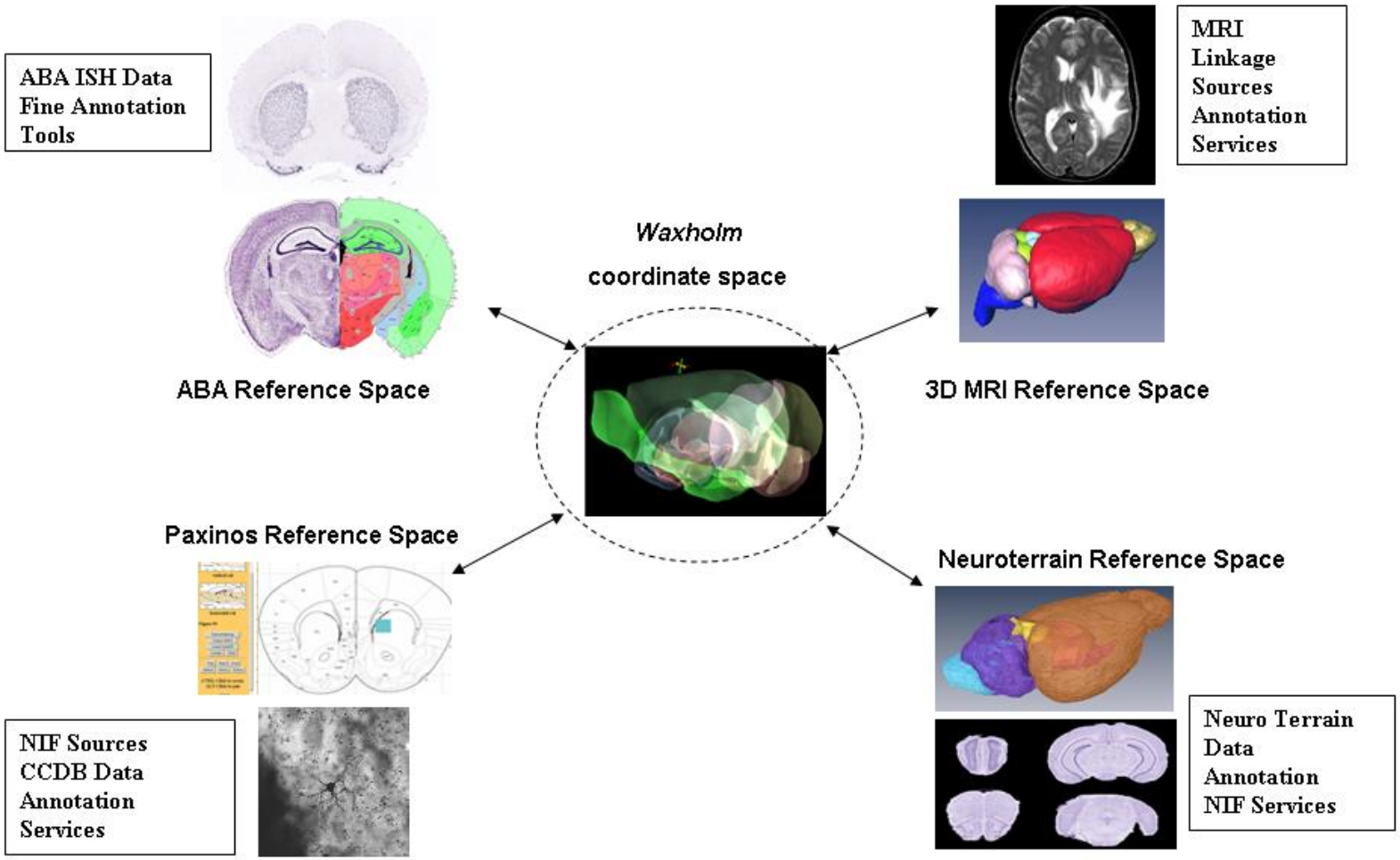







dorsal
left
posterior
anterior
right
ventral

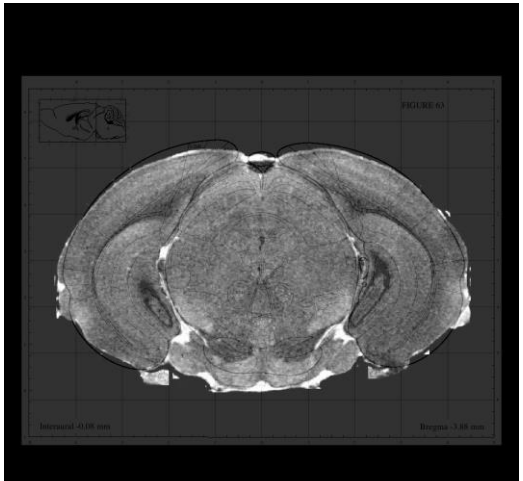
The Central Role of Waxholm Space

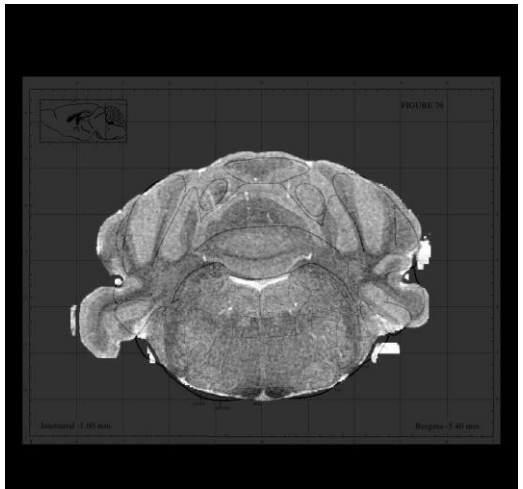


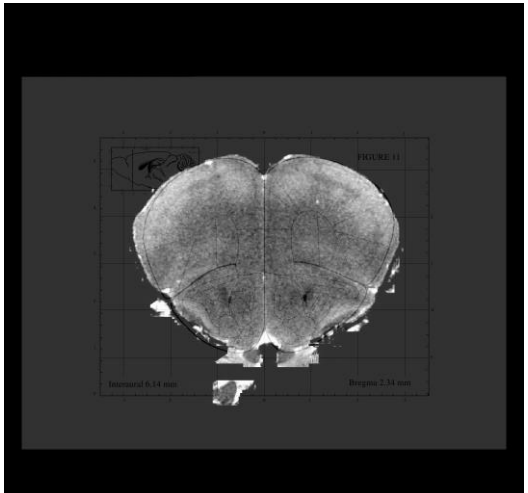
Different types of transformations

- ABAvoxel to WHS
  - Large volumes for transforms in both directions, between 3D and 3D of different dimensions
  - Then simple lookup in the transformation volume
- ABAvoxel to ABAreference
  - Collection of conversion formulas for individual slices
- ABAvoxel to AGEA
  - Simple scaling
- WHS to Paxinos Mouse Atlas
  - Warping appropriate WHS cuts to match with Paxinos slices; translations per slice and brain region

ListTransformations
GetTransformationChain
DescribeTransformation
TransformPOI







Standardization of atlas services

incf-dai

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AtlasFunctionHubApplicabilityTable

Updated Feb 2
davlit0917

Atlas Function-Hub Applicability Table

This table indicates which INCF Atlas processes are applicable to the various hubs.

- An X is an implemented process and is a link to an example.
- An O is a planned process but is not yet implemented.
- A blank cell means the process is not applicable to the hub.

	Central	ABA Hub	EMAP Hub	UCSD Hub	WHS Hub
GetCapabilities[1]	X	X	X	X	X
DescribeProcess[1]	X	X	X	X	X
DescribeSRS		X	O	X	X
DescribeTransformation		O	O	O	O
Get2DImagesByPOI	X[2]	X		X	
GetCorrelationMapByPOI	X[2]	X			
GetGenesByPOI	X[2]	X	O		
GetObjectsByPOI	O[2]	O	O	O	O
GetPropertiesByPOI	O[2]	O	O	O	O
GetStructureNamesByPOI	X[2]	X		X	X
GetTransformationChain[3]	X				
ListSRSs	X[2]	X	O	X	X
ListTransformations	X[2]	X	X	X	X
Retrieve2DImage		O		X	
TransformPOI		X	X	X	X

- [1] The WPS **GetCapabilities** and **DescribeProcess** requests are applicable to central and all hubs.
- [2] Union operation across hubs.
- [3] Central only processes.

The services use OGC Web Processing Service (WPS)

Date: 2010-09-01

Reference number of this INCF document: INCF 10-001

Version: 0.6

Category: INCF Discussion Paper

Editor: Ilya Zaslavsky

INCF Atlas Services and Waxholm Markup Language

Digital Atlasing Infrastructure Task Force

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i

Waxholm Markup Language (WaxML):

XML schema that provides standard constructs for atlas services

Different types of transformations

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