



72W

68W

64W

60W

16N

Eastern Caribbean Open-Source Geospatial Data Sharing and Management Workshop

Data Collection and Management in the Caribbean

Spice Island Resort, St. George's, Grenada

October 6 – 7, 2011

Presented by: Shawn A. Boyce, CIMH

Eastern Caribbean Open-Source Geospatial Data Sharing and Management Workshop

October 6-7, 2011 St. George's, Grenada



CIF
CLIMATE INVESTMENT FUNDS



72W

68W

64W

60W

Outline

- Introduction
- Hydro-meteorological networks
- Data Collection
- Data Management
- Caribbean Water Information System
- DEWETRA Platform
- References

Eastern Caribbean Open-Source Geospatial Data Sharing and Management Workshop

October 6-7, 2011 St. George's, Grenada



CIF
CLIMATE INVESTMENT FUNDS



72W

68W

64W

60W

Introduction

- The problem:
 - Caribbean countries generally do not have long term data collection and management strategies/policies
 - Strategies need to be clearly articulated for sustainability and should be part of national development plans
 - Assessments of the hydro-meteorological sensors in country is generally not performed
 - Data collection, storage, management and retrieval procedures need to be improved

Eastern Caribbean Open-Source Geospatial Data Sharing and Management Workshop

October 6-7, 2011 St. George's, Grenada



CIF
CLIMATE INVESTMENT FUNDS



72W

68W

64W

60W

Hydro-meteorological Networks

• Network Design

- A data network is an integrated group of data collection and transmission activities designed to address a set of objectives (e.g. WRA, DM, CC).
- Network design should address the following questions
 - What variables need to be observed?
 - Where should monitoring take place?
 - How often do the variables have to be observed?
 - What is the duration of the monitoring programme?
 - How accurate should the observations be?

Eastern Caribbean Open-Source Geospatial Data Sharing and Management Workshop

October 6-7, 2011 St. George's, Grenada

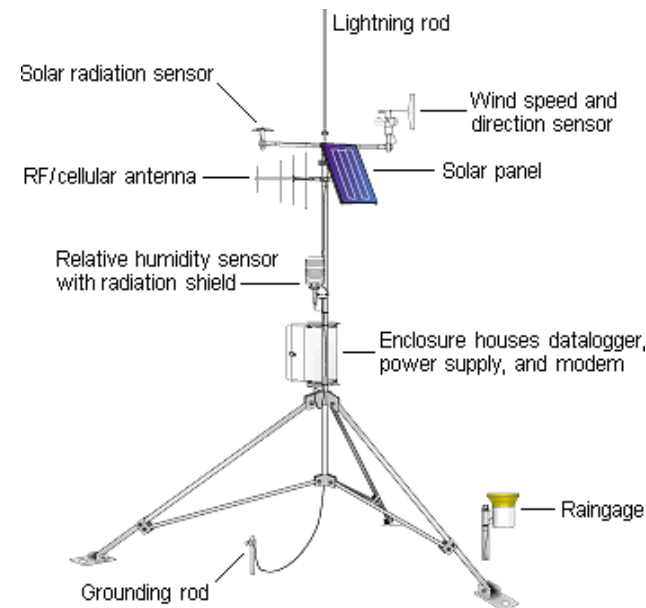


CIF
CLIMATE INVESTMENT FUNDS

Hydro-meteorological Networks...cont'd

• Climatological Stations

- The following types of data should be collected at climatological stations in the basic network:
 - precipitation, temperature, humidity, solar radiation, wind speed and wind direction.
 - Such data are sensed at most airports with AWS systems installed.
 - Station density, data storage and maintenance can be problematic
 - Data collected by observers should also be included



Eastern Caribbean Open-Source Geospatial Data Sharing and Management Workshop

October 6-7, 2011 St. George's, Grenada



Hydro-meteorological Networks...cont'd

Hydrometric Stations

- Surface water flows
 - River gauging activities should be sustainable
 - Continuous monitoring should be encouraged
 - Deficiency in surface water flow data in the Caribbean
- Water quality parameters
 - physical parameters, inorganic chemical components, organic chemicals, dissolved gases and biological parameters
 - These data are generally not routinely monitored



Eastern Caribbean Open-Source Geospatial Data Sharing and Management Workshop

October 6-7, 2011 St. George's, Grenada

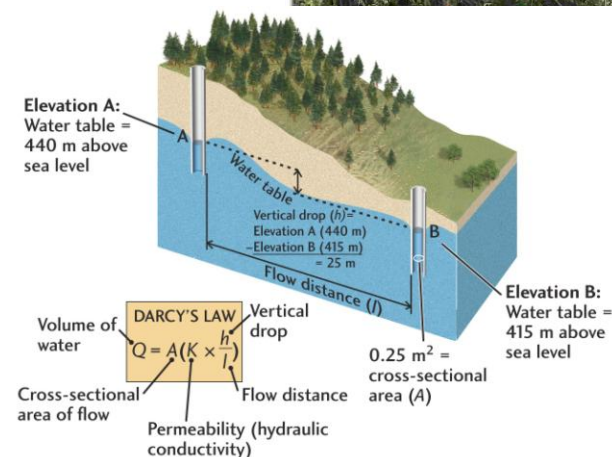


Hydro-meteorological Networks...cont'd

Hydrometric Stations

Ground water

- A significant amount of hydrogeological information is required to plan sampling strategies and to manage aquifers.
- These include (i) water levels, (ii) hydraulic gradients, (iii) hydraulic conductivities, (iv) porosities, (v) structural geology and (vi) lithology data.
- This information can be obtained through the use of groundwater monitoring instruments (e.g. piezometers, pressure transducers) combined with geological and geophysical surveys.



Eastern Caribbean Open-Source Geospatial Data Sharing and Management Workshop

October 6-7, 2011 St. George's, Grenada





72W

68W

64W

60W

Data Collection

- Site Maintenance

- The WMO recommends that the following maintenance activities be conducted at data collection sites

- Service the instruments
 - Replace and upgrade instruments as required
 - Retrieve and record observations
 - Perform recommending checks on retrieved records
 - Carry out general checks on of all equipment and transmission facilities
 - Clear debris and overgrowth from all parts of the installation
 - Comment on changes in land use and vegetation
 - Record all activities

Eastern Caribbean Open-Source Geospatial Data Sharing and Management Workshop

October 6-7, 2011 St. George's, Grenada



CIF
CLIMATE INVESTMENT FUNDS



72W

68W

64W

60W

Data Collection...cont'd

- Site Maintenance...cont'd
 - There is a need for capacity building
 - Routine care and maintenance of instruments
 - Procedures for taking observations and/or retrieving data from instruments
 - Completion of field notebooks and report forms using standard notations
 - Routines for automatic and real-time stations
 - Training is required to ensure adequate management of instruments and data collection activities
 - The CIMH provides meteorological and hydrological technician training at varying levels
 - Students have the opportunity to participate in an instrument maintenance and repair course

Eastern Caribbean Open-Source Geospatial Data Sharing and Management Workshop

October 6-7, 2011 St. George's, Grenada



CIF
CLIMATE INVESTMENT FUNDS



72W

68W

64W

60W

Data Collection...cont'd

• Data Transmission

- At all data collection sites a value must first be sensed (e.g. rainfall amount, water depth), then encoded or recorded and finally transmitted.
- It is often necessary to provide an automatic transmission facility when stations are installed at remote locations or when data are required to feed into real time systems.
- The possible choices of transmission include:
 - Dedicated land lines
 - Commercial telephone
 - Commercial cellular networks
 - Direct radio links
 - Satellite links
 - The internet

Eastern Caribbean Open-Source Geospatial Data Sharing and Management Workshop

October 6-7, 2011 St. George's, Grenada



CIF
CLIMATE INVESTMENT FUNDS



72W

68W

64W

60W

Data Management

- Data retrieval

- analogue systems

- most data retrieval is done on site by observers using standard forms
 - Forms have to be processed
 - Observation error, missing data

- digital systems

- data retrieval process more efficient and flexible
 - data in digital form can be retrieved remotely and easily processed using computing systems.
 - Can operate in a real-time environment

Eastern Caribbean Open-Source Geospatial Data Sharing and Management Workshop

October 6-7, 2011 St. George's, Grenada



CIF
CLIMATE INVESTMENT FUNDS



72W

68W

64W

60W

Data Management...cont'd

- Quality Control

- operational activities that are used to ensure that quality data are collected and disseminated
 - Quality control measures are often ignored
 - types of errors usually encountered are (i) random errors, (ii) systematic errors, (iii) data processing errors and (iv) representative errors
 - Quality control procedures should be able to (i) identifying whether raw and processed data are within acceptable parameter limits, (ii) identifying whether the rate of change of raw and processed data are plausible and (iii) examining established relationships among related parameters

Eastern Caribbean Open-Source Geospatial Data Sharing and Management Workshop

October 6-7, 2011 St. George's, Grenada



CIF
CLIMATE INVESTMENT FUNDS



72W

68W

64W

60W

Data Management...cont'd

- Database Management

- common in the Caribbean to find multiple agencies charged with hydro-meteorological data collection.
- These usually include but are not limited to
 - water authorities
 - agricultural departments
 - meteorological services
 - drainage/water resources divisions
 - commercial and private entities.
- This leads to an inefficient approach to data collection as very often there is a lack of communication and inefficient data sharing across departments
 - Assessment of hydro-meteorological sensors

Eastern Caribbean Open-Source Geospatial Data Sharing and Management Workshop

October 6-7, 2011 St. George's, Grenada



CIF
CLIMATE INVESTMENT FUNDS



72W

68W

64W

60W

Data Management...cont'd

- Database Management...cont'd
 - Hydrometeorological data are stored in numerous formats
 - Hard copy, spreadsheet, text
 - Database management software provides an efficient means of storing, querying and retrieving data.
 - Currently a number of different databases are used in the region to store data
 - Access – Hydraccess, HYDATA
 - MySQL – Water Information Systems
 - Oracle – Clicom, Hydromet
 - The software should provide a GIS based user interface for easy visualization of spatio-temporal relationships
 - data should be able to be accessed remotely by users across networks

Eastern Caribbean Open-Source Geospatial Data Sharing and Management Workshop

October 6-7, 2011 St. George's, Grenada



CIF
CLIMATE INVESTMENT FUNDS



72W

68W

64W

60W

Data Management ...cont'd

- Where are we now?
 - The CIMH has limited control over local data collection activities
 - Assistance is provided on request
 - Unclear whether installation guidelines and data collection protocols are strictly followed
 - The CIMH has been involved in number of regional initiatives which seek to implement data monitoring networks
 - CIMH is a regional centre for data archiving
 - A number of initiatives have developed or will be developing a database at CIMH
 - CIMH will be consolidating these databases

Eastern Caribbean Open-Source Geospatial Data Sharing and Management Workshop

October 6-7, 2011 St. George's, Grenada



CIF
CLIMATE INVESTMENT FUNDS



72W

68W

64W

60W

Data Management...cont'd

- Where we are now?
 - Data Rescue
 - Comprehensive database structure to consolidate rescued climate and hydrology data
 - Initial steps towards a unified regional water information system
 - Caribbean Water Information System (Links Grenada, Jamaica and Guyana NWISSs)
 - Management of hydro-met data in a geo-spatial environment
 - DEWETRA real-time decision support platform for disaster managers
 - Numerical prediction products
 - Satellite products
 - AWS data
 - Static data (GIS layers)

Eastern Caribbean Open-Source Geospatial Data Sharing and Management Workshop

October 6-7, 2011 St. George's, Grenada



CIF
CLIMATE INVESTMENT FUNDS



72W

68W

64W

60W

Caribbean Water Information System

• Background

- Jamaica and St. Lucia had NWISs installed with similar architecture
- CARIWIN provided resources to develop and implement the Grenada WIS
- CADMII provided funds towards the development of the Guyana WIS
- The Caribbean WIS is based on the Grenada Water Information System established under CARIWIN (2007).
- The WISs use up-to-date Web technologies to provide reliable and easy access to water related data
- The goal of the Caribbean WIS is to link these and other planned WIS WebMap applications together for backup/archiving purposes

Eastern Caribbean Open-Source Geospatial Data Sharing and Management Workshop

October 6-7, 2011 St. George's, Grenada



CIF
CLIMATE INVESTMENT FUNDS



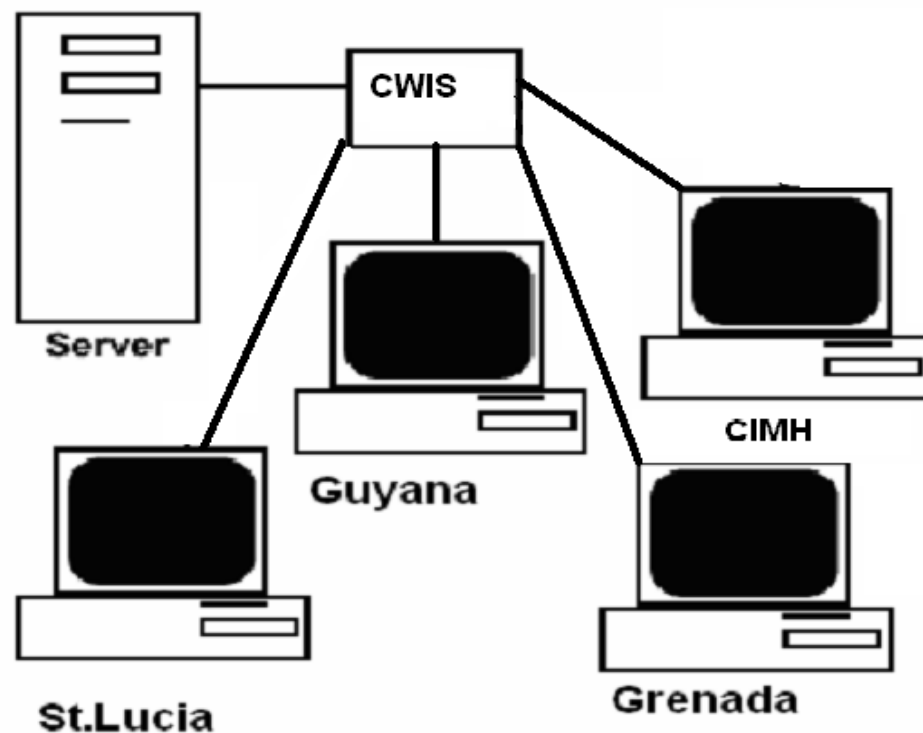
72W

68W

64W

60W

Caribbean Water Information System...cont'd



Eastern Caribbean Open-Source Geospatial Data Sharing and Management Workshop

October 6-7, 2011 St. George's, Grenada



CIF
CLIMATE INVESTMENT FUNDS



72W

68W

64W

60W

Caribbean Water Information System...cont'd

Caribbean Water Information System



Database:

Predefined View:

Raster Images:

Point Objects:

Username:

Password:

©2008 WebMap Application 4.0
Developed by: [Dejan Lekic](#), [Jim Joseph](#)

Eastern Caribbean Open-Source Geospatial Data Sharing and Management Workshop

October 6-7, 2011 St. George's, Grenada



CIF
CLIMATE INVESTMENT FUNDS



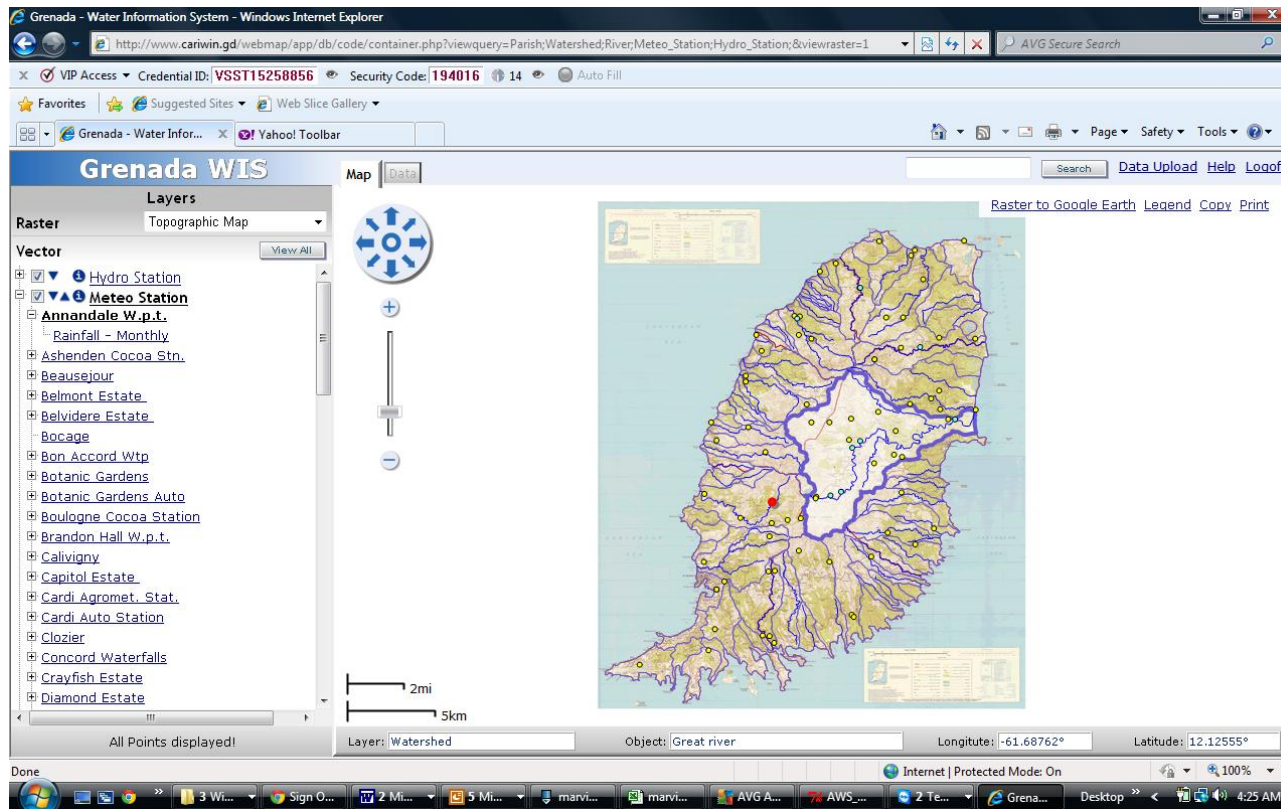
72W

68W

64W

60W

Caribbean Water Information System...cont'd



Eastern Caribbean Open-Source Geospatial Data Sharing and Management Workshop

October 6-7, 2011 St. George's, Grenada



CIF
CLIMATE INVESTMENT FUNDS



72W

68W

64W

60W

Caribbean Water Information System...cont'd

- Log on to website
 - Regional Database
 - Caribbean Water Information System
 - http://63.175.159.29/carib_webmap/app/db/index.php

16N

Eastern Caribbean Open-Source Geospatial Data Sharing and Management Workshop

October 6-7, 2011 St. George's, Grenada



CIF
CLIMATE INVESTMENT FUNDS



72W

68W

64W

60W

ERC Project

Project Funding:	Government of Italy
Implementation Agency :	Caribbean Institute for Meteorology and Hydrology (CIMH)
Executing Agency:	United Nations Development Programme Barbados & the OECS (UNDP)
Beneficiaries:	Barbados & OECS Countries
Project Value:	€3,500,000
Project Duration:	3 years ending December 31 st , 2013

Eastern Caribbean Open-Source Geospatial Data Sharing and Management Workshop

October 6-7, 2011 St. George's, Grenada



CIF
CLIMATE INVESTMENT FUNDS

ERC Project - Objective

Implementatio
n of a **network**
for real time
sharing of
hydro
meteorological
data

Strengthened
national disaster
mechanisms to
incorporate best
practices in
volunteerism,
enhanced
institutional
capacities and
support to

**Strengthened
Civil Protection
Mechanisms**

Eastern Caribbean Open-Source Geospatial Data Sharing and Man

tsunami public
education
programme

October 6-7, 2011

ERC Project - Outputs

Output 1-Network of real-time decision support centres for early warning created

1.1 Implementation of a network for real time sharing of hydro meteorological data through the sub-region of Barbados and the OECS (€ 950,000)

1.2 Capacity building for use of real-time hydro meteorological data as decision support system for early warning (€ 500,000)

1.3 Creation of plan for acquisition of the new hydro meteorological data (€ 100,000)

Eastern Caribbean Open-Source Geospatial Data Sharing and Management Workshop

October 6-7, 2011 St. George's, Grenada





72W

68W

64W

60W

DEWETRA Platform

Quasi-static information

Real-time information

$$R = E \times V \times H$$

The equation $R = E \times V \times H$ is shown with red circles around 'E' and 'H', and red arrows pointing from the labels 'Quasi-static information' and 'Real-time information' to them respectively.

- Quasi-static information: element at risks, hazard maps, etc.
- Medium and short range weather/hydrological forecast
- Hydro-meteorological monitoring
- Ground effects prediction (flood, soilslip, wild fire)
- Uncertainty estimation and measure

Eastern Caribbean Open-Source Geospatial Data Sharing and Management Workshop

October 6-7, 2011 St. George's, Grenada



CIF
CLIMATE INVESTMENT FUNDS



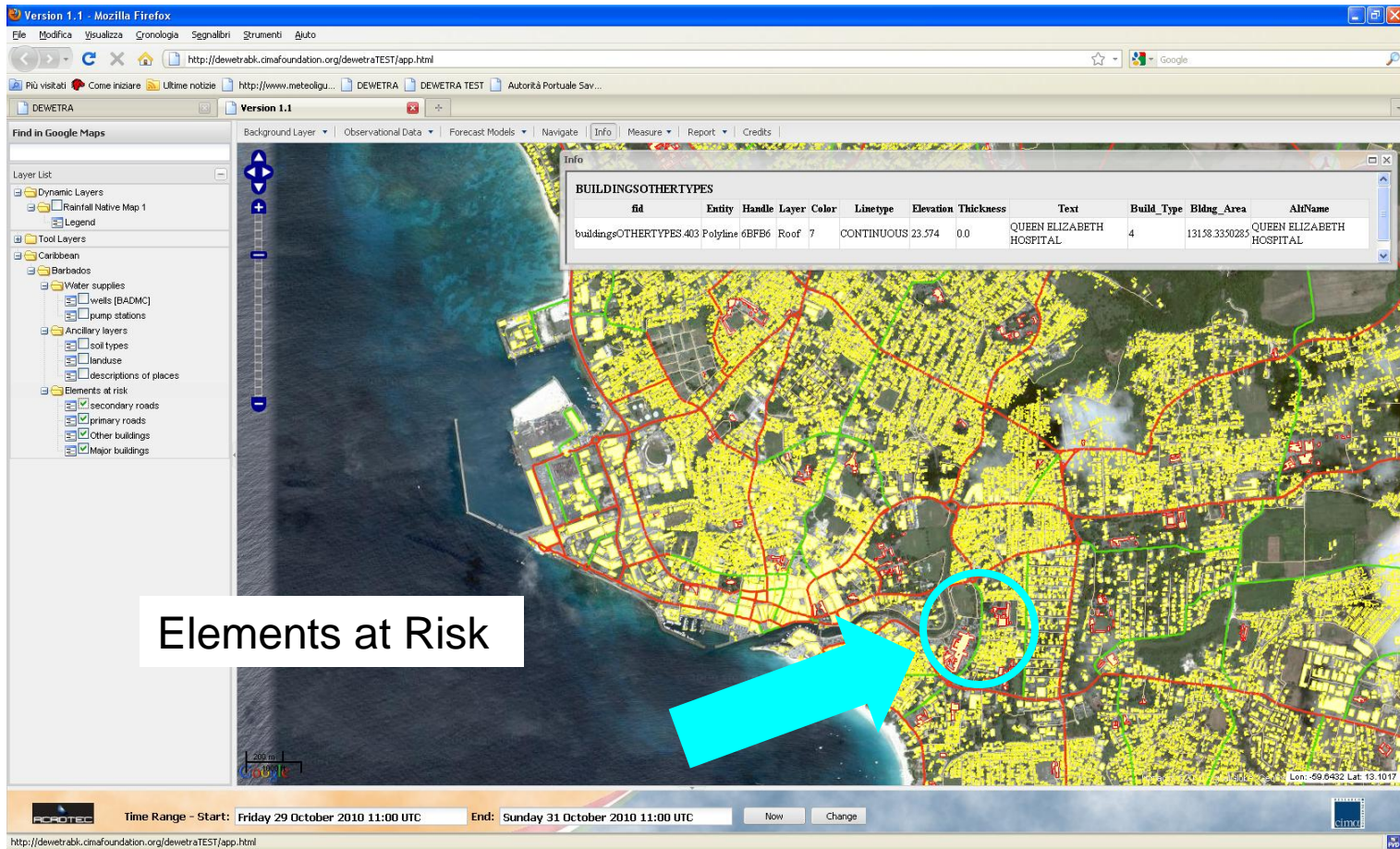
72W

68W

64W

60W

DEWETRA Platform...cont'd



Eastern Caribbean Open-Source Geospatial Data Sharing and Management Workshop

October 6-7, 2011 St. George's, Grenada



CIF
CLIMATE INVESTMENT FUNDS



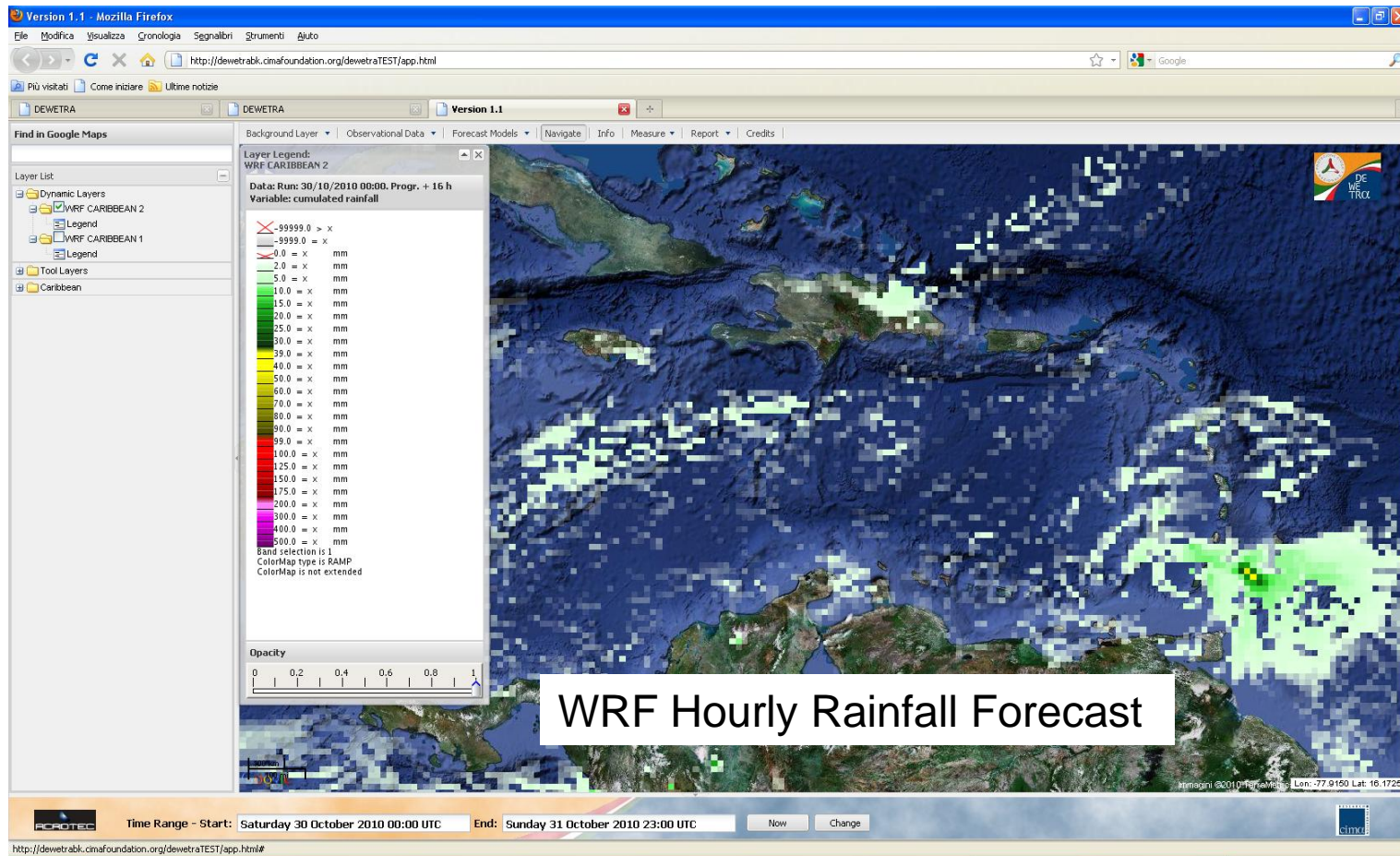
72W

68W

64W

60W

DEWETRA Platform...cont'd



Eastern Caribbean Open-Source Geospatial Data Sharing and Management Workshop

October 6-7, 2011 St. George's, Grenada



CIF
CLIMATE INVESTMENT FUNDS



72W

68W

64W

60W

DEWETRA Platform...cont'd

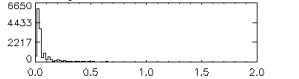
AMS-R-E, 2010-Oct-30, Ascending Passes

Cloud Liquid Water, Zoom Factor = 5



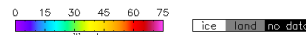
Statistics :
Min: 0.00
Max: 1.76
Mean: 0.09
Rms: 0.19

Histogram of Data in selected area



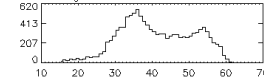
SSM/I F15, 2010-Oct-30, Morning Passes

Atmospheric Water Vapor, Zoom Factor = 5



Statistics :
Min: 15.30
Max: 63.60
Mean: 41.11
Rms: 9.67

Histogram of Data in selected area



NASA/MODIS Rapid Response System

CLOUDSAT

Remotely Sensed Products

Eastern Caribbean Open-Source Geospatial Data Sharing and Management Workshop

October 6-7, 2011 St. George's, Grenada



CIF
CLIMATE INVESTMENT FUNDS



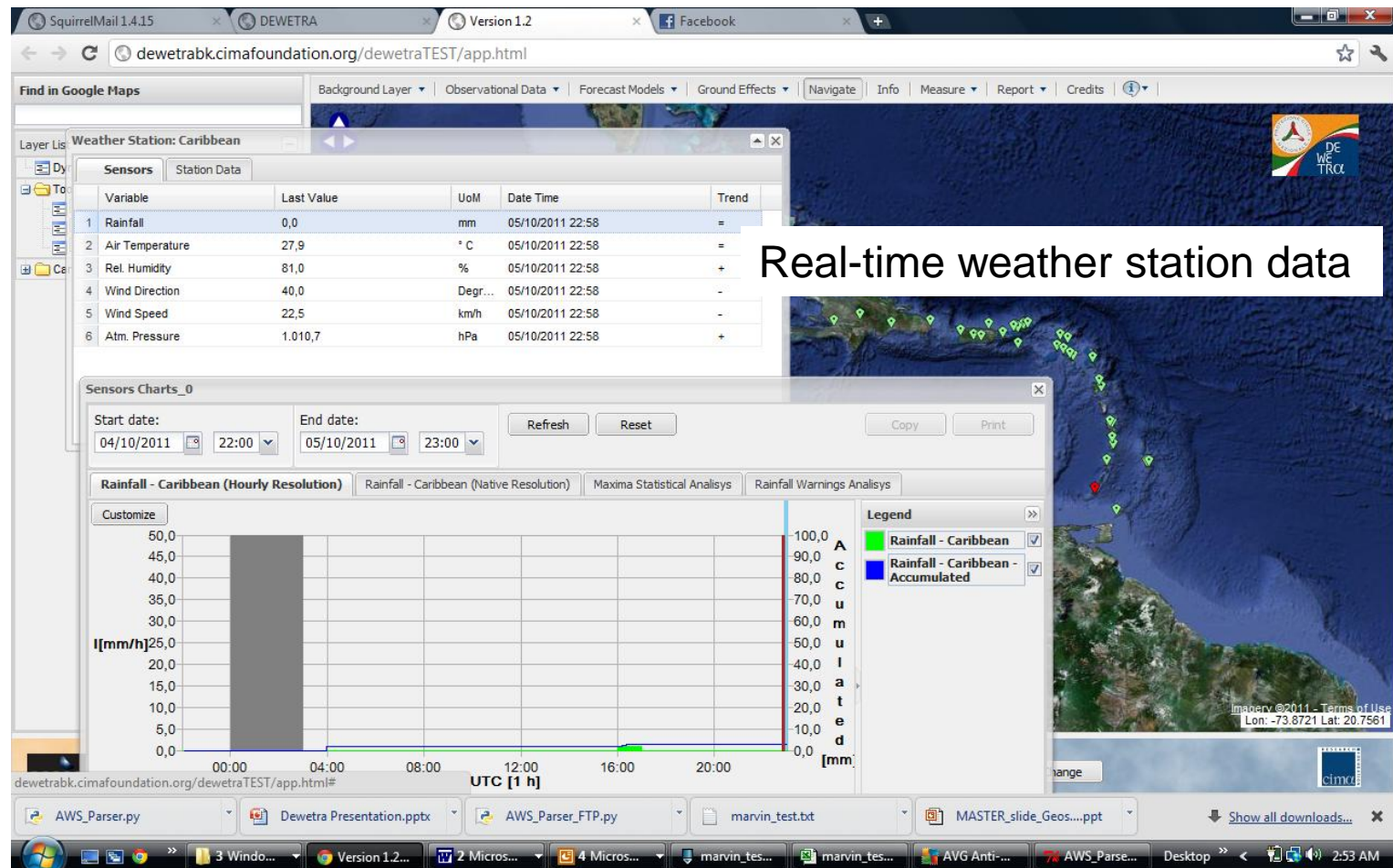
72W

68W

64W

60W

DEWETRA Platform...cont'd



Real-time weather station data

Eastern Caribbean Open-Source Geospatial Data Sharing and Management Workshop

October 6-7, 2011 St. George's, Grenada



CIF
CLIMATE INVESTMENT FUNDS



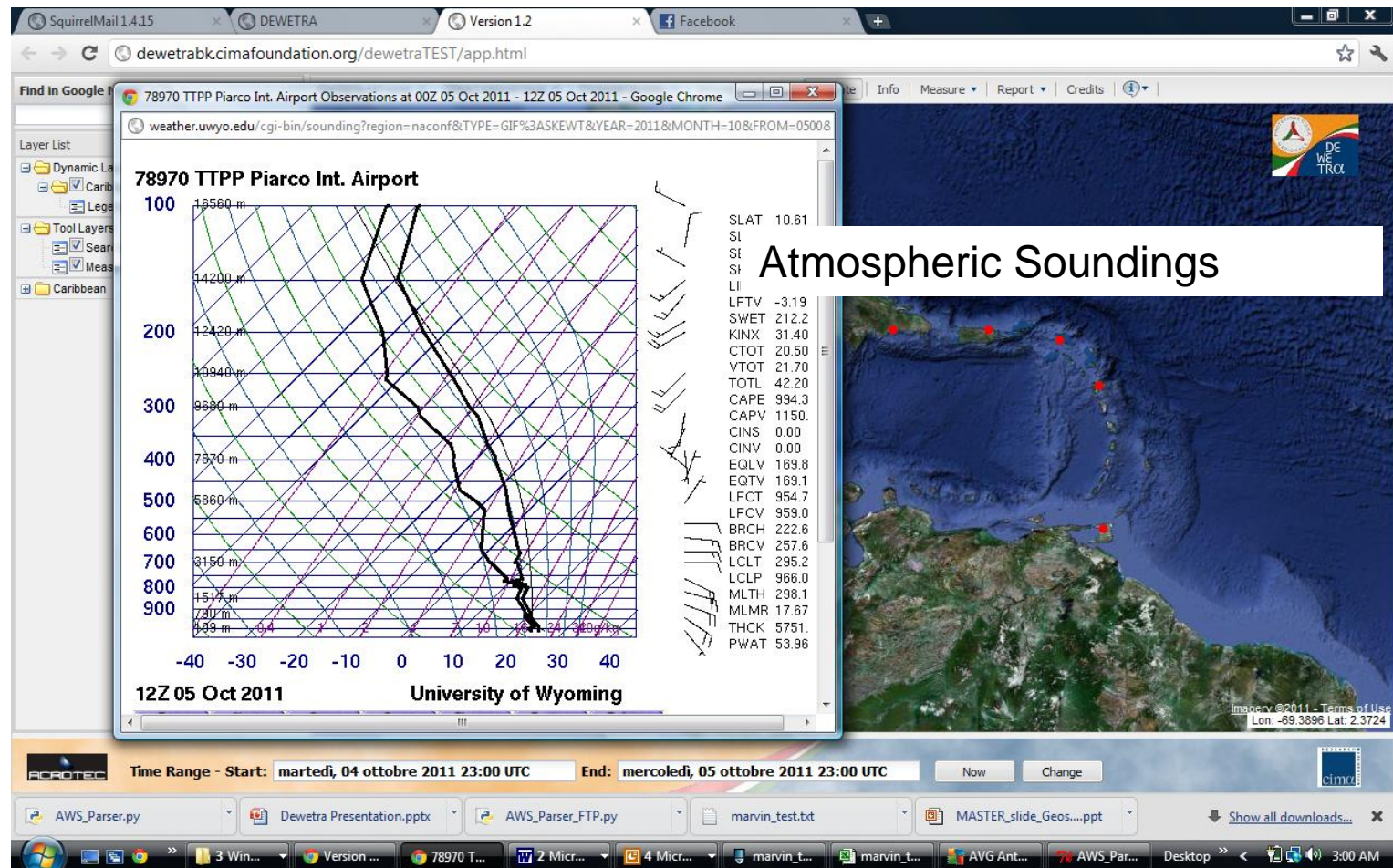
72W

68W

64W

60W

DEWETRA Platform...cont'd



Eastern Caribbean Open-Source Geospatial Data Sharing and Management Workshop

October 6-7, 2011 St. George's, Grenada



CIF
CLIMATE INVESTMENT FUNDS



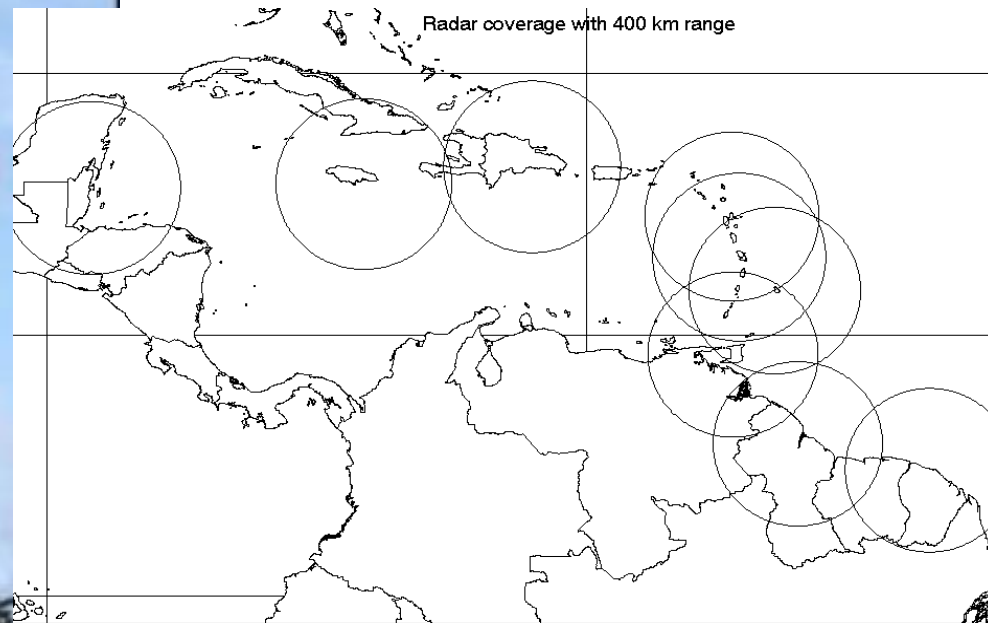
72W

68W

64W

60W

DEWETRA Platform...cont'd



Work in progress: Weather radar data

Eastern Caribbean Open-Source Geospatial Data Sharing and Management Workshop

October 6-7, 2011 St. George's, Grenada



CIF
CLIMATE INVESTMENT FUNDS



72W

68W

64W

60W

DEWETRA Platform...cont'd

- Logon to website
 - DEWETRA Platform
 - <http://dewetrabk.cimafoundation.org/dewetraTEST/>

16N

Eastern Caribbean Open-Source Geospatial Data Sharing and Management Workshop

October 6-7, 2011 St. George's, Grenada



CIF
CLIMATE INVESTMENT FUNDS



72W

68W

64W

60W

References

- CIMH (2011). Data Collection and Management Strategy for the Commonwealth of Dominica.: Caribbean Institute for Meteorology and Hydrology.
- WMO (2008a). Guide to Meteorological Instruments and Methods of Observation.: World Meteorological Organisation-No. 8.
- WMO (2008b). Guide to Hydrological Practices.: World Meteorological Organisation-No. 168.
- Zahumenský, I., (2004). World Guidelines on Quality Control Procedures from Automatic Weather Stations.: World Meteorological Organisation.

Eastern Caribbean Open-Source Geospatial Data Sharing and Management Workshop

October 6-7, 2011 St. George's, Grenada



CIF
CLIMATE INVESTMENT FUNDS