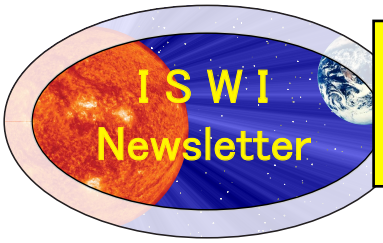
SPACE WEATHER SCHOOL
Basic theory and hands-on experience
September 20 – October 2, 2010
University of HELWAN / EGYPT

SUMMARY



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GIS
Télesphore Brou

- Basic concepts and theory of GIS
- Structuration of a geo referenced data base
- Presentation of a structured data base on line : SIEREM
- Map reference with GPS
- Integration of GPS data to SIG
- Request and geo statistic analysis
- Handling of a SIG (Map Info or ArcGis)
- Presentation of an Open Source : Mapwindow
- Extraction of pictures from Google Earth, to manage and bear and integrate geo references in a SIG

- Software SIG MapInfo preferentially or ArcGis
- GPS Garmin preferentially

ARCGIS data Modeling
Maroun Mounzer

Tentative Workshop Outline:

Time	**Topic**
14:00 – 14:30	1. Introduction to ArcGIS and Geodatabase Concepts
14:30 – 15:00	2. GIS Requirements Review/Validation/Analysis
15:00 – 16:30	3. Data Modeling – Conceptual Design
16:00 – 16:30	Break
16:30 – 17:00	4. Data Modeling – Logical Design
17:00 – 17:30	5. Data Modeling – Physical Design
17:30 – 18:00	6. Geodatabase configuration and Testing
	a. Data Evaluation
	b. Source Data Matrix
	c. Data Conversion Methodology and Specifications
	d. Geodatabase Configuration
	e. Pilot Testing and Model Revisions
	f. Data Model Documentation
18:00 – 18:30	7. Geodatabase Development
	a. Data Conversion/Migration
	b. Data QA/QC and Loading
	c. Training and Deployment
18:30 – 19:00	8. Questions and Closing Remarks

Geodesy
Frédéric Masson

During the first part of the training, we will introduce the GPS system. This part will be done conjointly with O. Bock in charge of the atmospheric part of the training.

In the second part we will focus on the use of the GPS in the earth sciences and more especially in the solid earth studies (mainly plate movements, plate tectonics and seismic cycle). Examples from Turkey and Afar will illustrate these lectures. A short view of the other geodetic techniques for the solid earth studies will be proposed. Finally we will make some practices:

1- Use of a GPS receiver, extraction of the data, conversion, quality check
2- Use of the data bases.
3- Computation of a velocity field from a set of data (example of the Afar region)
4- Seismic hazard computations helped by GPS data (example of the Anatolian fault).

Meteorology
Olivier Bock

The lecture will focus on modelling the GPS signal propagation in the troposphere and the processing of data in geodetic mode and estimation of tropospheric parameters (zenith delays, gradients) along with station position. The correlation between zenith tropospheric delays and station height will be emphasized. The impact of changing models (e.g. troposphere) and the impact of un-modelled or mis-modelled error sources like antenna phase centre variations, multipath, site displacements due to loading effects on station position and zenith tropospheric delay estimates will be studied. Finally, examples of applications of ground-based GPS network in atmospheric sciences and operational weather forecasting will be presented.

Content of lecture:
1. Introduction
2. Tropospheric delay modelling
3. GPS processing
4. Correlation between ZTD et height
5. GPS meteorological applications

The practical courses will consist in:
1. Making observations with a dual frequency GPS receiver and computing its position using a commercial software
2. Processing a baseline with data from permanent receivers using a scientific software
3. Analyzing zenith tropospheric delays available from the IGS web server for permanent GPS stations.

Schedule:
Lecture (Monday 20th, 14:00-15:30): first part (Chapters 1 to 3)
Practical course No.1 (Monday 20th, 16:00-19:00): The use of a GPS receiver
Practical course No.2 (Tuesday 21st, 16:00-19:00): GPS data processing
Lecture (Wednesday 22nd, 11:00-12:30): second part (Chapters 4 and 5)
Practical course No.3 (Thursday 23rd, 11:00-12:30): Products and analyses

Ionosphere
Patrick Lassudrie Duchesne and Rolland Fleury

Cours 1 : Introduction to GNSS (GPS, GLONASS, Galileo, …) (3 h)
Cours 2 : The propagation Earth-satellite : Influence of the Earth atmosphere (troposphere, ionosphere) (2h),

TP :

- Use of the ionospheric data bases : GPS Measurements (files RINEX), ionosonde measurements (SPIDR, ULCAR) (4h)
- GPS ionospheric map (IONEX) (1h)

Lecture and TP ionosphere

Lecture 1 : Introduction to the Global Navigation Satellite System (GNSS)

- Radiolocation systems
- GPS
  - System overview
  - Space, control and user segments
  - Satellite signals
  - Receiver position and time
  - Measurement errors
- Atmospheric effects on signal propagation
  - Ionospheric effects
  - Tropospheric effects
- Data processing
  - Model correction
  - Dual frequency correction
  - Relative positioning
  - Code and phase measurements
- Future GNSS
- Conclusions

Lecture 2: Earth-space propagation

- The terrestrial atmosphere
  - Nomenclature
  - The standard atmosphere
  - Refractive effects
- Effects of the troposphere on propagation
  - Path length increase
  - Attenuation due to atmospheric gases
  - Tropospheric scintillation
  - Attenuation due to hydrometeors
- The ionosphere
  - Morphology
  - Solar terrestrial relationships
  - Ionospheric perturbations
- Effects of the ionosphere on propagation

- Plasma frequency
- Refractive effects
- Faraday effects
- Ionospheric scintillations

- Summary

Sites Web used

IGS Central bureau : http://www.igs.org/index.html
(onglets : Mail + Tracking Network)

Data 1 (USA) : http://sopac.ucsd.edu/
Data archive + Network
Data 2 (NASA) : ftp://cddis.gsfc.nasa.gov/pub/gps/
Data 3 (France) : ftp://igs.ensg.ign.fr/pub/igs/
Data 4 (Allemagne) : http://igs.bkg.bund.de/index/index
Data 5 (USA) : http://www.unavco.org/
Data 6 (USA) http://www.ngs.noaa.gov/CORS/download2/

IGS Central bureau : ftp://igscb.jpl.nasa.gov/
Onglet : pub/data/format : rinex , sinex, sp3, ionex (explique les formats)

Rinex 2.10 : http://www.ngs.noaa.gov/CORS/instructions2/

Hatanaka compression
http://www.ngs.noaa.gov/CORS/software/
ftp://terras.gsi.go.jp/software/

GPS calendar : sopac/other
http://www.ngs.noaa.gov/CORS/instructions3/

ALMANACS :
http://www.navcen.uscg.gov/gps/almanacs.htm

IONEX :
Codg : ftp.unibe.ch/aiub/CODE/2010

IRI
Modèle en ligne : http://modelweb.gsfc.nasa.gov/models/iri.html

IONOSONDES :
Mesures verticales : http://spidr.ngdc.noaa.gov/spidr/
Ionogrammes temps réel : http://umlcar.uml.edu/DIDBase/

Utilities : TEQC : the Facility's "translate, edit, quality check" program
(http://facility.unavco.org/software/software.html)

Solar and Heliopheric Physics
Luc Damé

The Solar and Heliospheric Physics course is divided in 5 lectures and includes a visit to the Helwan Observatory (where a H-Alpha Solar Activity Monitoring Station is being installed recently) the last day of the School (Saturday October 2). Each lecture is planned for 1h30.

LECTURE 1 – Tuesday 28
It shines
1.1 - The Sun, a star that shines
1.2 - Some tools for solar plasma diagnostics

LECTURE 2 — Tuesday 28
It shapes
2.1 - The solar magnetic field
2.2 - Structure of the solar atmosphere

LECTURE 3 — Wednesday 29
It shakes
3.1 - Activity and Solar Eruptive Events
3.2 - Process release of magnetic energy
It heats
3.3 - Heating of the solar corona

LECTURE 4 — Saturday 2
It moves
4.1 - The solar wind: energy balance, simple model of Parker, fast Wind and transport of energy in the solar wind
4.2 - Transients in the heliosphere
It impacts
4.3 - Dynamics and global electrodynamics of the magnetosphere and ionosphere

LECTURE 5 — Saturday 2
It observes
5.1 - Optical principles of spectroscopy and solar monitoring applications
5.1 - Data bases in Solar Physics and basis of data treatment.

Data Base
Mikhael Zhizhin

The Space Physics Interactive Data Resource (SPIDR) (http://spidr.ngdc.noaa.gov) is a de facto standard data source for solar-terrestrial physics, functioning within the framework of the World Data Center System. It is a distributed database and application server network, built to select, visualize and model historical space weather data. SPIDR can work as a fully-functional web-application (portal) or as a Grid of web-services, providing functions for other applications to access its data holdings.

Currently SPIDR archives include solar activity and solar wind data, geomagnetic, ionospheric, cosmic rays, radio-telescope ground observations, telemetry and images from NOAA, NASA, and DMSP satellites. SPIDR portals, databases and services are installed in the USA, Russia, China, Japan, Australia, South Africa, France and Ukraine. SPIDR has more than 20 000 registered world-wide users and daily load of about 100 user sessions per site. SPIDR technology has proven to be useful for environmental data sharing, visualization and mining, not only in space physics, but also in diverse environmental arenas such as seismology, GPS measurements, tsunami warning systems, and others.

The hands-on training will include basic course for interaction with the SPIDR web portal as well as in-depth lessons for web service use with SOAP and REST clients (Java, Matlab, IDL), installation and management of a SPIDR node, database architecture, and metadata management in SPIDR Virtual Observatory

Grid Day
Monique Petitdidier

Heavy computations, how can grid help you
Thursday 30 September 2010

9h-9h15 WELCOME (15min)

9h15- 9h45 INTRODUCTION (30min)
Web, Grid and cloud computing, HPC... Dr Mikhail Zhizhin (GCRAS-Russia) (30 min)

9h45- 10h45 INTERNET NETWORK (1h)

- Network in Egypt Dr Ayman Bahaa (EUN) (30min)
- The World Football Cup, Africa and Internet performance: Dr L. Cottrell (SLAC, USA) – 30min

Pause

11h15- 12h15 RESOURCES AVAILABLE IN EGYPT(1h)

- HPC, Grid in Egypt: Prof. Salwa Nassar (NARSS & ERI) 30min
- EGI – Monique Petitdidier (IPSL/LATMOS&UVSQ&UPMC&CNRS, France) 30min
- How to access the resources - demonstration Dr Salwa Nassar & Eng. Maha Dessouky

12h15 -12h30 **Short Round table with the previous speakers to answer assistance questions**

14h-16h GRID APPLICATIONS ACTIVITIES (2h)
CMS - Egyptian colleague ***1h***

- What is the CMS experiment & participation of Egypt Dr A. Radi & CERN
- Demonstration to run CMS simulation Dr A. Radi & CERN

Earth Science: ***1h***

- Earth Science applications on Grid: Dr Monique Petitdidier
- Demonstration of a Helwan University application : Dr A. Radi

Pause

16h30-18h F UTURE ACTIVITIES
Space Weather Monitoring Center (SWMC) needs in terms of informatics resources related to projects: Dr. A. Mahrous (30min)
EUMEDGRIDsupport Activity: (30min) Dina Barakat (Egyptian University Network)
EPIKH and Linksceem 2 Prof. Salwa Nassar (NARSS & ERI) 15-30min

18h-19h: Round table with all the speakers for final conclusions

Lectures on the Internet and Mobile Computing

Dr. Les Cottrell, SLAC
University of Helwan / Egypt, Sept 18 – Oct 3, 2010

1. **The Internet, the world cup and Africa, see http://www.slac.stanford.edu/grp/scs/net/talk10/helwan10.pptx**
   Thursday 30th September, 10:15-10:45am Grid Day
   - Methodology
   - Current State
   - What is happening?
   - Impact
   - Next Steps
2. **Internet History, trends and futures, see http://www.slac.stanford.edu/grp/scs/net/talk10/internet-history.pptx**
   Sunday 26th September 9:00-9:45am
   - Brief history
   - Design goals
   - Growth & Success
   - Current challenges
   - Internet NG
   - What is driving the changes
3. **How is the Internet performing, see http://www.slac.stanford.edu/grp/scs/net/talk10/perform.pptx**
   Sunday 26th September 9:45-10:30am
   - Internet characteristics
   - Users, capacities, satellites, packet sizes, protocols, routing, flows
   - How is it used apps etc.
   - How the Internet worldwide is performing as seen by various measurements and metrics
   - Application requirements
4. **Cell Phones, see http://www.slac.stanford.edu/grp/scs/net/talk10/cellphone-work.pptx**
   Monday 27th September, 9:00 - 9:45am
   - Not covering Cordless phones, CB radios, pagers, car phones, Iridium etc.
   - How they work
   - History
   - Cell phone components
   - Power
   - Carriers
   - Coverage
   - Bars
   - Growth

- Concerns

5. **Smart phones & other Mobile computing, see http://www.slac.stanford.edu/grp/scs/net/talk10/smartphones.pptx**
   Monday 27th September, 9:45 - 10:30am
   - Wireless
   - What is a smartphone and their growth
   - Why are they important
   - How are they used
   - What's coming
   - Bandwidth impact
   - Not for everybody yet
   - Laptops & Netbooks
   - Smartbooks
   - Tablets
   - WiFi
     - How it works
     - Protocols
     - WiFi and smartphones
6. **Diagnosing network problems for non-networkers, see http://www.slac.stanford.edu/grp/scs/net/talk10/diagnosis.pptx**
   Wednesday 29th September, 16:00 - 17:30pm
   - Goal: provide a practical guide to debugging common problems
   - Why is diagnosis difficult yet important?
   - Local host
   - Ping, Traceroute, PingRoute
   - Looking at time series
   - Where is a node
   - Who do you tell, what do you say?
   - Case studies and More Information
7. **Network Measurements, see http://www.slac.stanford.edu/grp/scs/net/talk10/internet-measure.pptx**
   Wednesday 29th September, 17:30-19:00pm
   - Why is measurement important?
   - LAN vs WAN
   - Passive
     - SNMP, Netflow
     - Effects of measurement interval
   - Active
   - Tools various
     - Ping, traceroute
     - Available bandwidth, achievable bandwidth
   - PingER

Others

Probably we will not cover the items below due to lack of time.

1. **Geolocation, see http://www.slac.stanford.edu/grp/scs/net/talk10/geolocation.pptx**
    - Importance
    - How is it done
    - Dynamic method
        - RTT => distance
        - Geometrical methods of finding location from circles
    - Application
    - Challenges
2. **Internet case studies**
    - Digital Divide and Africa (some of this will be covered in the Grid Day presentation)
    - Cable cuts
    - Impact of TEIN3
    - Pakistan
3. **How does the Internet work, see http://www.slac.stanford.edu/grp/scs/net/talk09/ictp-tcpip.ppt**