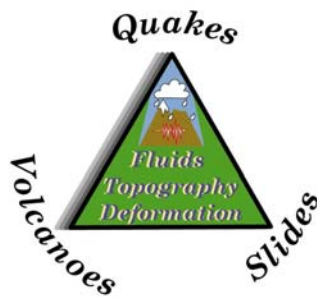


RETINA SECOND ANNUAL MEETING

Cambridge, UK
9-10 January 2004



Agenda and minutes

by Olivia Lesne

Meeting participants:

Person	Acronyms	Partner	E-mail
Olivia LESNE	OL	ACRI-ST	oli@acri-st.fr
Kurt FEIGL	KF	CNRS.DTP	Kurt.Feigl@cnes.fr
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Antonio TROTA	AT	CVUA	at@notes.uac.pt
Antonio CUNHA	ACu	SRHE/SRPCBA	srpcba@mail.telepac.pt
Yves GUGLIELMI	YG	CNRS-GA	Yves.Guglielmi@geoazur.unice.fr
Jean VIRIEUX	JV	CNRS-GA	virie@geoazur.unice.fr

Presentation schedule :

Thursday January 8:

Arrival and check in.

Friday January 9:

Meeting in Moller center, see detailed schedule below.

19h: Cambridge Moment and Dinner at St John's college

Saturday January 10 :

09h00 Cars depart from Moller Centre for field trip around Cambridge.

Lunch at restaurant

15h30 Cars return to Moller Center. Time for breakout meetings, walking, talking

Sunday (11 Jan) :

Departure.

Friday 9 January

Start Time	Deliverable	Title	PARTNER (speaker)	Deliverable code.
07:30		Breakfast available		
09:00		Welcome, objectives, etc	Kurt Feigl	
	D 27	Estimated daily positions, SW Iceland CGPS network, for current volcanic deformation	IMO (Halldor Geirson)	M24 Da PU
	D 33	Raw data from Azores CGPS network, available 24 hours after acquisition	CVUA (Antonio Trota)	M24 Da PU
	D 32	Azores CGPS network and processing center becomes fully operational	CVUA (Antonio Trota)	M24 De PU
	D 34	Estimated daily positions and velocities, Azores CGPS network, 2 weeks after acquisition	CVUA (Antonio Trota)	M24 Da PU
	D 30	Evaluation data set from NRT CGPS for Barcelonnette and La Clapière landslides.	CNRS-GA (Jean Virieux)	M24 Da PU
10:30		Coffee		
	D 40	Nonlinear inversion algorithm for all types of geodetic data (<i>Pederssen et al. Paper is a very good start.</i>)	NVI (Thora Arnadottir)	M24 Me PU
	D 31	Chronological sequence of interferograms and/or aerial images for two landslides. (<i>late because Christophe Delacourt didn't get enough money</i>) <i>Change to GIS for Tinee Valley</i>	ACRI-ST (Olivia Lesne)	M24 Da PU
	D 19	Method for accurate relative earthquake locations and fault plane identification	IMO (Kristin Vogfjord)	M24 Me Re
canceled	D 49	Method and end user guidelines for combining geodetic, seismic results in hazard assessment (<i>delayed to M24</i>)	IMO (Pall Halldorsson)	M12 Me PU
canceled	D 50	Regional classification of strain accumulation in SW Iceland (<i>to be delayed</i>)	IMO (Pall Halldorsson)	M24 Da PU
canceled	D 24	Preliminary models; calibrated magnitude-frequency distributions: landslides & triggers	UCAM-DES (Niels Hovius)	M24 Me PU
12:30		Lunch	All	
14:00	D 43	First version of software implementation of model for VO-hydrological coupling (<i>late because of error in SOW</i>)	NVI (Freysteinn Sigmundsson)	M12 Me PU
	D 44	Validation of VO-hydrological coupling model by application to SW Iceland.	NVI (Freysteinn Sigmundsson)	M24 De PU
14:15		On the physics of stresses propagating in the lithosphere?	UCAM-DES (John Haines)	45-minute keynote
		Discussion, brainstorming	All	
16:00		Coffee		
16:30		Scheduling FORESIGHT	Oliva Lesne, Kurt Feigl	
		Discussion, brainstorming	All	
		Breakout meeting GPS Azores	Kurt, Antonio, Freysteinn	
		Breakout meeting GIS group	Amy, Olivia, Gabriela	
		No talk necessary:		
	D 37	GIS layers of bathymetry, Submarine multibeam and side-scan sonar maps and report (<i>late because Azores cruise has not yet happened</i>)	TOUL (Anne Briaes)	M36 Da CO
	D 5	annual meeting 2 minutes	ACRI-ST (Olivia)	M24 Re CO
	D 8	annual report 2	ACRI-ST (Olivia and Kurt)	M24 Re CO
19:00		Dinner in St John's College	John Haines	

Presentations can be found on the ACRI ftp server ([ftp.fr-acri.com](ftp://ftp.fr-acri.com) with the retina login and password)

9:00 **Kurt Feigl, CNRS.DTP**
Welcome, objectives, etc...

Most of the WP are on schedule.
Turkish colleagues (from FORESIGHT project) have not been able to join us because they did not get visas.

Halldor Geirson, IMO
CGPS observations in the Iceland Natural Laboratory

Deliverable D27: Estimated daily positions, SW Iceland CGPS network, for current volcanic deformation.

Other tasks: NRT automatic analysis
Visualization of GPS results

GPS network mainly along coasts
1995: start of GPS installation
1999: extension of the network

GPS data collected in a 24h basis
Time-series show a coseismic displacement in mid 2000 in east and north component

Current station velocities (relative to REYK) => 1999 to 2003 data show an opposite displacement on both sides of a line crossing Iceland from NE to SW.

Volcanic deformation in South Iceland:

- Hengil, Hekla, Eyjafjallajökull and Heimaey: no significant deformation observed
 - Kafta volcano: inflation
- ⇒ deformation of the magma chamber
⇒ state of the volcano by GPS = goal of D27.

Towards real-time results: limitation of the results because of short integration time and small latency.

- Data processed in 1, 2 and 3 hours batches => better with 3 hour batch
- 2 time interval were chosen
- Use of Bernese software with 2 processing strategies => strategy B is better

Study case: June 200 earthquake. This kind of processing is useful because we can get the offset (earthquake can be identified). With 1 hour batch, it is not possible to detect precursors.

Near-real time processing in automatic mode will be launched this spring.

KF: what kind of orbits is used?

HG: Final orbits => predicted orbits should not have an influence on short baselines.

KF: Predicted orbits => no problem for accuracy but for latency, better to take predicted than ultra-rapid orbits.

KF: how long is the processing?

HG: 30 min for a 3 hour batch

KF: should try a 5 hour batch which should be even better

JV: is there a broad-band seismometer close to the GPS stations?

HG: at 20 km, there is one.

AT: telephone lines or radio-modem for the stations?

HG: telephone lines.

Antonio Trota, CVUA

Deliverables D32, D33, D34

3 CGPS stations but only one belongs to CVUA:

1 CVUA station (QBN1)

1 EUREF station (PDEL)

1 belongs to a private company (RIB1)

RETINA should have allowed the acquisition of 3 GPS stations but restriction only permitted to buy one station.

February 2003: installation of the station. At the beginning, problems of power supply and PCMC card.
2002: antenna used for a campaign period.

In the future, CVUA will try to install two more stations and to recover data at least once a day.

Try to improve processing with Bernese.

Objectives: automatic processing + acquire another machine to try GAMIT software to improve their knowledge in processing strategies.

Remote access to alf.uac.pt

Username = retina

Pwd = rootretinal

Main tasks in the future:

- improve the processing strategy
- make links in-between the stations

Processing with GAMIT realized with French and Icelandic group for local campaigns (1992-2000)
+ Campaign at the benchmarks that Retina group visited at the kick-off meeting.

Need more data and densify the network to understand the local movements of the volcanoes + different behaviours in the zone.

Problems in placing stations in bedrock (when lava flow, it is easy but otherwise it is difficult)

Holes = 1.5 to 2 m deep (for new monuments)

JV: what is the strategy to have 2 nearby GPS stations (distance less than 2 km) for checking stability?

AT: Usually, the strategy is try to understand regional deformation and if features are well defined, stations can be placed on both sides of the features. But the strategy of CVUA is to try to have a regular network. So first is to put as much stations as possible, then see the strain rate and then change the strategy if needed.

JV: what is the price of the system?

AT: installation + acquisition = 150-200 €

Jean Virieux, CNRS.GA

Evaluation data set from NRT CGPS for La Clapière landslide

La Clapière + Barcelonnette was planned but study on la Clapière only => prefer densify on la Clapière landslide rather than doing both.

Objectives:

- the design of the system was done the first year of Retina. The second year focused on radio-transmission. Monofrequency L1 data set are used
- possible detection of warning signals (warning system).

1 permanent station CLAP on front of the landslide + 1 permanent station RABU (installed this last summer) connected to REGAL/RENAG network (both are dual-frequency stations).

Two mono-frequency stations on the landslide: CLP1 and CLP2

Start of the processing this summer 2003.

One of the L1 antenna (CLP1) have been installed on an area with a big motion.

Installation: GPS logger and radio-transmission + power supply (solar panel).

KF: Have you observed any deformation between RABU and CLAP

JV: Tests have been done but as far as the availability of the dataset, there is no motions (< 1 mm) nut need more data.

KF: is there a meteorological station?

JV + YG: one is installed above the CLP2 staion, one should be installed in the sliding zone near CLP1.

2 choices: local computation at the permanent house near the landslide or processing done at CNRS.GA. The second solution has been adopted for the moment but in case, they have the choice.

Claude Pambrun was in charge of the radio-multiplexing flux of GPS data (Caution: must purchase the correct radio-modem => must be able to multiplexe).

Real-time GPS storage: Data are recovered up to now by car.

Window strategy (6h sliding window) with 2 blinding window (before 6AM and after 6PM) because must be a day processing.

CLP1 and CLP2stations:

200 days at CLP1

100 days at CLP2

Difference in velocity slope between spring and fall (need to have 1 more year to see if there is a cycle). Need also to have 6 more months to have a 1 year behaviour. Moreover, 6 months is the period of infiltration.

TA: have you compared with tacheometry?

JV: It is in our perspectives.

2 hour sliding window: errors are bigger in the vertical component.

4 points per day.

Perspectives:

- setting telephone connection
- adding a station on la Clapière because of evidence of fracture zones at the top of the landslide.
- comparison with tacheometric data

Conclusion: La Clapière is now on permanent investigation (third year).

TA : on Azores and La Clapière stations, there are radoms, but there are problems with conical radoms.

KF: Hemispherical is better than conical.

AT: is the movement of the La Clapière landslide quick or slow?

YG: La Clapière started slowly and then a swelling of the bottom of the landslide occurred leading to a big acceleration (collapse).

10:30 **Thora Arnadottir, NVI**

Non-linear inversion algorithm for all types of geodetic data

In June 2000, two earthquakes (17 and 21 June) triggered 3 M5 earthquakes.

The time series of VOGS-REYK show that the offset can be clearly seen but it is bigger than expected.

The offset includes event M5.5 + M5 north of VOGS.

Joint inversion of INSAR data and data from 40 GPS stations

3 papers on the results that acknowledge Retina.

Cristina Catita will re-visit the co-seismic inversion as part of her thesis research. Her Ph.D. thesis is at the University of Lisbon, with several months of research work in collaboration with Kurt Feigl.

Thora Arnadóttir (NVI) is now working on applying this same algorithm to the 1998 earthquakes near Hengill

The static Coulomb calculations indicate that the June 17 earthquake triggered the June 21 earthquake. Now the next question is how the three events in the first 5 minutes on the Reykanes peninsula (over 70 km away from the June 17 mainshock) were triggered. We are considering two classes of mechanism: dynamic triggering by the propagating seismic waves and/or a 2-step process, such as triggered hydrological changes increasing the Coulomb failure stress. Both processes involve very challenging numerical modeling

Olivia Lesne, ACRI

Upper Tinée Valley GIS database

The area of study of the GIS database (deliverable D51 already delivered at M12) has been increased to Upper Tinée Valley (area covering about 40 by 15 km). The updated GIS contains Landsat image, hydrogeological informations (given by Yves Gugliemi from CNRS.GA), landslide areas, toponymy and 7 cross-sections along the valley.

The content of the GIS database has been shown on Mapinfo software.

Kristin Vogfjord, NVI

Method for accurate relative earthquake locations and fault plane identification

Goal = subsurface fault mapping with micro-earthquakes in near-real time in the Hengill region, SW Iceland

Dataset = ~96 000 earthquakes between 1992 and 2000.

The major concern is the quality of data through time.

Test on dataset for May 25-30, 1999:

Selection of events with relative error < 50m in latitude and longitude and depth < 100 m to be able to detect the direction of the fault.

=> 3 main faults have been detected.

Location accuracies are on the order of 10 meters.

Still more work to do.

Futur: automatic detection of fault plane (done manually up to now)

End of Retina: automatic NRT of Hengill region (beyond deliverable)

JV: the precision of 10m in location is very ambitious

TA: Web results on the Hengill region show that this accuracy can be achieved

JV: 10m is a good target for cross-correlation.

What about clustering? Should try on that direction

Estimation of the work: 1 month of calculation for the whole dataset with 4 linux stations + 1 month of interpretation. Kristin's student is working on this approach for the June 2000 earthquakes in the SISZ. Applying the approach to the Hengill area seems to be second priority. On schedule for delivering a catalog at M36

14:00 **Simon Dadson, UCAM.DES**

Increased erosion in Taiwan driven by earthquakes and typhoons

High precipitation and typhoons lead to erosion rate in Taiwan.

Seismicity and runoff variability are the 2 things that can control decadal erosion.

Article: Dadson et al., 2003, Nature, 426 : 648-651.

Location of high seismicity matches pretty well with erosion .

The M_w 7.6 Chi-Chi earthquake in 1999 triggered 20,000 landslides and has been followed by a typhoon that triggered 30,000 landslides.

The earthquake has an influence on the hillslope of the landslide but not much in the channel network.

The river response to earthquake is a shift in magnitude by 3 or 4 times in the rating curve after an earthquake. The greatest increases follow the faults so the areas disturbed by landslides.

YG: how can you know that a landslide has been triggered by an earthquake?

SD: some can be active landslides before the earthquake and be accelerated by the earthquake.

Freysteinn Sigmundsson, NVI

First version of software implementation of model for VO-hydrological coupling

Methodology : NVI follows the approach of Jonsson et al.

Article: Jonsson et al., 2003, Nature, 424 :179-183.

The gravity field is composed by free air effect + water table effect + deformation effect + residual gravity.

1994-2000: high activity in south and central Iceland

Inflation: 2 study cases:

Krafla: deflation after 1989

Askja caldera: water or gas?

D43: short report on approach will be delivered next month (for M24)

D44: half year late => delayed to M36

Deliverables for IMO:

D49: 12% of the work has been done

An account of what have been done will be delivered at M24

D50: error in the application => delayed to M36

John Haines, UCAM.DES

Seismic stress in three-dimensional topographies.

Sophisticated numerical models for the complete waveform in an arbitrarily complicated medium suggest that local conditions can change seismic shaking drastically. Amplification factors can change from 2 to 5 over distances less than 100 meters

Regarding triggering processes involving the interplay of elastic waves and fluid flow in a porous medium: could be considered a diffusive process, but more work is required to estimate a diffusivity and/or a time scale. If dissipation is considered, the problem becomes "horrendous".

Action items:

AI people having a deliverable at M24 : send progress report to Olivia Lesne <oli@acri-st.fr> before Friday January 16, 2004.

AI FORESIGHT partners: Prepare to fill in the CPF forms for FORESIGHT project

Schedule/Next meetings:

August 1, 2004	Foresight contract begins
September 8-10, 2004	Earth System 2004 Istanbul Symposium Foresight Kick-off ?
October 2004	Azores exercise ?
November/December 2004	Foresight Kick-off ?
April 2005	EGU, Nice, France
May 1, 2005	Retina final meeting Azores exercise ?
August 31, 2005	last day of RETINA contract

Discussion

FS presentation of the consortium:

Mid-Ocean Ridge Experiment on Iceland = MORE Iceland

The objective is to try to uniform all the efforts from the last 10 years and to increase the data in the next 10 years (200 GPS stations and more seismometers)

The objective is to form a consortium of people interested and get international support for at least 10 years (10 to 20 M€)

People can participate in the consortium to instrument Iceland

First meeting at EGU in Nice, France (April 2004)
+ Workshop organised by NORDVULK in Iceland (July 2-7, 2004)

Purpose:

- Review science during the last decade
- Instrumentation
- Discussion on deformation processes

Updated information on the Workshop at Nordvulk web site: <http://www.norvol.hi.is/> (click on MORE Iceland):

Mid-Ocean Ridge Experiment on Iceland (MORE Iceland)

A Natural Hazard Observatory for the World

Iceland is the world's largest sub-aerially exposed part of the mid-ocean ridge system. The island itself and the larger surrounding plateau include examples of most of the major tectonic elements of the ocean basin: spreading ridge segments, transform faults, a propagating rift, and a plume, as well as an example of plume-ridge interaction. Frequent earthquakes and volcanic eruptions make the region an exceptional natural laboratory for studies of earthquake and magmatic processes, earthquake and volcano hazard, and volcano-tectonic interaction, with frequent opportunities to observe key processes such as stress migration, earthquake triggering, and viscous relaxation of the lower crust and upper mantle.

While many key scientific questions in Iceland can be answered by individual, PI-driven investigations, certain classes of problems require large data sets beyond the scope of an individual researcher. Moreover, several key data sets either do not exist at present, or are limited in terms of accuracy, bandwidth, spatial or temporal coverage, or other characteristics. Examples include continuous GPS (CGPS) stations (currently there are 17; 200 or more are desirable), broadband seismic stations (currently 6; 40 or more are desirable), strainmeters (currently 7; 30 or more are desirable), and high accuracy (10 cm), lidar-based digital topography of the active plate boundary zone (currently non-existent).

The building of the MORE-Iceland consortium has started. The initiative was presented to a group of US and Nordic investigators at a summer school in Iceland in September 2003 (organized by the Ridge2000 program and the Nordic Volcanological Institute, funded by NSF and NorFA). University of Miami, Florida will lead the initiative and the search for support for the MORE-Iceland concept in the USA, and the Nordic Volcanological Institute will lead similar effort in Iceland. A good long-term collaboration in geophysical research is between the relevant institutes in Iceland, and Icelandic Meteorological Office and the Science Institute, University of Iceland will be key members of the MORE-Iceland consortium. The Icelandic partners will initially contact their European collaborators in geophysical research, in order to seek support from EU and other potential sources in Europe.