

Geotechnologien-Projekt EXUPÉRY

– KOORDINATOREN: TORSTEN DAHM, MATTHIAS HORT, JOACHIM WASSERMANN –

Summary of 4th Exupéry Workshop in Darmstadt Nov. 23-24th, 2009

Participants (from north to south):

Klemen Zakšek, Lars Krieger, Matthias Hort, Manocher Shirzaei, Conny Hammer, Klaus Stammler, Stefan Bernsdorf (Monday), Carl Gerstenecker, Gwendolyn Läufer, Sabine Rötliberger, Dieter Steineck, Matthias Becker (Monday), Ralf Drescher (Monday), Meike Rix, Xiaoying Cong (Monday), Moritz Beyreuther, Joachim Wassermann.

General issues:

Publications: EOS would be good, problem what type, full featured article (2.500 words) or brief report (1.500). The former allows also teams as authors the later does not. Agreed to go for a brief report. Everyone should check in his institution if that is ok as M. Hort will appear as the only author on that paper.

A full article should be written by the whole group for JVGR.

Special issue of Applied Geodesy on Geotechnologien: Deadline is end of February for manuscripts (call for papers below). Can someone prepare some contribution for it?

Call for Papers
International Association of Geodesy
Journal of Applied Geodesy
Special Issue on Early Warning Systems for Natural Hazards

Dear Colleague,

With the increasing demand for early warning systems for natural hazards ranging from multi-sensor monitoring systems to fast response systems and evacuation there is a growing need for research in these areas. Landslides, earthquakes, tsunamis and volcanic unrest are typical examples for natural hazards. Damages for infrastructures and cities can reach enormous amounts.

Original contributions in areas related to enabling technologies and algorithms for new robust warning systems, information systems and evacuation procedures are solicited for this special issue of the Journal of Applied Geodesy. We have chosen the 3rd issue of Vol. 4 (2010) as special issue. Therefore the manuscript submission deadline is February 28, 2010.

The authors are required to follow the Author's Guide for manuscript submission to the Journal of Applied Geodesy at <http://www.degruyter.de/journals/jag/detailEn.cfm>.

The manuscripts will be peer reviewed according to the standard Journal of Applied Geodesy procedures.

Please let us know within the next two weeks if you or someone from your group is planning to submit a paper.

Best regards,
Heribert Kahmen
Editor-in-Chief

Documentation: An outline is provided on the Web (<http://exupery-vfrs.de/How-to-set-up-use-VFRS.900+M54a708de802.0.html>). The documentation format was accepted. Timeline is: documentation should be complete for each project by the end of June next year, as this is the time when the project officially ends. Within the documentation there should be also a link to software download that should be open without password. However we will try to offer mailing list so everybody that downloads the code and gives us his email address can be informed in the case the code changes. -> K. Zakšek will ask CIS if it is possible.

Final Report: The final report is due on March 31st, 2011. With respect to the final report there are two possibilities, either each "Zuwendungsempfänger" writes his own report, or we compile everything and send that to the office as one package. The BMBF strongly suggests one report. I also think that this is the better way. We should therefore still adhere to the workpackage structure but in each report it has to be very clear which "Zuwendungsempfänger" did what. The details of what information is required are attached to this mail.

I will split the report in two parts, one describing the product of the project (in there pointing to the contribution of each "Zuwendungsempfänger", we will write that) and one which summarizes the scientific results. The project/product description will be taken from the Web Page, so there is no additional effort for you in this regard unless you have not completed your manual. The science results will be compiled for each WP (WP1: Carl Gerstenecker, WP2: Michael Eineder or Pieter Valks, WP3: Joachim Wassermann, WP4 Matthias Hort, WP5 Torsten Dahm) and then send to me. Those compilations have to include all required information for each "Zuwendungsempfänger". Klemen Zakšek will provide a style for the report sometime next year.

Aside from this each "Zuwendungsempfänger" has to provide the "Erfolgskontrollbericht" by him/herself (see attached documents). We will collect all these reports and attach them to the final report package.

Final note: As some of the students are finishing already this year I would like to ask the PIs of these projects to send their final reports earlier than March 2011 to the named coordinators of the different WP. The coordinators have to check if all required information is in the report.

Intermediate reports:

The next intermediate reports are due April 30th next year. Although the project ends at the end of June they have to be send!

Next Status Seminar:

The Geotechnologien office is planning the next and final status seminar for the second quarter of 2010. The exact dates and times will be communicated by the office.

Mettings:

DGG 2010 (Bochum, 15.-18.3)

I have contacted the Geotechnologienbüro and they will send an E-Mail to all coordinators regarding overview talks at the DGG. In addition everyone is welcome to send an abstract to that meeting.

EGU 2010 (Vienna 2.-7.5):

Each group submits a poster to the NH9.10 session (take the ones from the last Status meeting, no new ones unless you would like to add something). Deadline is Jan 18th! We will ask for one overview talk in that session on Exupery. If you are not planning to attend the meeting send the abstract for the poster anyway. Please send the poster to one who is going so it can be displayed.

GeoDarmstadt 2010:

Potential location to show more about Exupéry. Deadline 31st of March. We will ask for one overview talk.

http://www.geodarmstadt2010.de/index.php?option=com_content&view=article&id=114&Itemid=67&lang=de

Brainstorming for potential extension:

Note an extension is unlikely but we in order to have something in case we are asked for here is a small list of potential topics:

- Time dependent source and stress modelling
- Volcano package for Seiscomp 3
- Join satellite and ground based INSAR
- Data mining technologies
- Joint inversion of different data sets
- Ash and height retrieval ->aviation
- New observational techniques (e.g. ground based thermal observations at different wavelength)
- Determine the minimum number of instruments necessary
- A real stress test of the systems at a real volcano
- Optimize the database and GIS-interface

Potential cooperations:

<http://www.geohazards.buffalo.edu/VHub/summary/>

M. Hort will meet with G. Valentine at AGU to discuss potential use of our system as for providing real time observations and display capabilities.

General remarks about the GIS-system:

Stefan Bernsdorfs contract ends at the end of this year, so all **major** change to the GIS system must be finished until the end of this year. Stefan will do some limited services for the next half year so very small things can be fixed afterwards but for example adding a new layer or such is out of question.

Stefan Bernsdorf added some new features to the GIS system which need to be extensively tested.

- Global time filter: allows you apply the same time filter to all layers which are going to be added to the system. This is very convenient if you want to look at data from various sources for the same time window at the once.
- Interface manipulation: on the upper right bar you find several symbols that simplifies using the interface; e.g. one of the symbols is the typical symbol for storage, clicking on it allows you to store your current view.
- Time series: we will not provide time series from a random point in geotiffs. However, Stefan proposed to include some extra tags into the corresponding XML files – e.g. Xiaoying can add the data for her corner reflectors. These

- data for some special points in geotiffs are then easy to be presented in the same way the GPS time series is presented at the moment. Sabine, Xiaoying, Klemen and Manoochehr have to provide all the information Stefan needs to implement this functionality.
- Metadata: each subproject should check whether their metadata are correctly shown (e.g. if you click a point in a vector data, you get a pop-up window where some metadata are shown, there is also a link to the XML in the seishub database).

Discussion of user management:

User management needs to be done for the database. It would be very convenient to have a user management for also the GIS. The user profiles were considered a nice work around the user management at the moment so a general user management was considered of low priority.

The layer tree of the GIS system is currently stored outside the GIS system. This is very inconvenient as it can only be changed by Stefan. This should be added to the SeisHub data base. Task:-> S. Bernsdorf

A general user's manual needs to be written for the GIS Interface. Klemen will give that a shot in close collaboration with Stefan. Task:-> K. Zakšek

The administrator Manual for GIS has to be written by S. Bernsdorf

Status of each WorkPackage:

- Tasks referring to all projects like meetings final reports etc. have been taken out of the tables.
- GIS task were copied from the last protocol and checked and new ones were added

Workpackage 1 (Darmstadt, Kiel)

Task	7-12/07	1-6/08	7-12/08	1-6/09	7-12/09	1-6/10
Acquisition of IBIS-L DONE	█					
Selection and preparation of test area DONE	█					
DOAS acquisition, develop. and test DONE	█	█				
Hardware test of IBIS-L DONE	█	█				
Near-real-time retrieval of SO ₂ (DOAS) unclear, will most likely not work any more as so far no XML file exists	█	█				
Software development WLAN DONE, for Ubuntu, test for openWRT if modules compile.	█	█				
Software on line deformation current	█	█				
Software interface data base DONE	█	█				
Integration within VFRS; manual current	█	█				
Field Campaign Azores DONE	█	█	█			
Improvements of IBIS-L and DOAS system current				█	█	

To does left

Science:

Progress on data analysis? Problem with the data form the Azores is the there is no movement. New target is needed, maybe Hohenstaufen? Also working with PSI's in case of the IBIS system is highly desirable.

GIS System

- Coherence image is not transparent. **Does not look too good.**
New solution: provide a second image which only shows values above certain coherence. Present low coherence in black, high coherence transparent.
- Phase image different color style. **Done**
- Info box for the displacement images. What is needed is the extract from the XML File, e.g. the time difference between the images that have been used for the displacement calculation. **Done**
- Display of time histories is unclear will be done only for the chosen points (written to XML).
- GPS displacement data display. Task: Legend is needed -> S. Bernsdorf.

Hansteen:

Since there is still no XML file it might be difficult to add this functionality to the system. Thor: **get that file as soon as possible to S. Bernsdorf!** The requests for the GIS functionality defined in Hannover still apply, they are not repeated here.

Workpackage 2 (Munich, Oberpfaffenhofen, Hamburg)

2a) SO₂ measurements

Task	7-12/07	1-6/08	7-12/08	1-6/09	7-12/09	1-6/10
Near-real-time retrieval of GOME-2 SO ₂ DONE	[Progress bar]					
Develop. of volcanic monitoring service DONE	[Progress bar]					
Estimation of SO ₂ emission and validation current	[Progress bar]					
Operation of volcanic monitoring service DONE	[Progress bar]					

Science: validation and height estimation of SO₂ clouds are currently worked on, additional information.

GIS interface:

- Infos for the whole image are required, unclear how to display them. Info button is currently for extracting the value of one pixel from the image. Stefan will most likely add another button on the layer control. **Done**
- Problem with trajectory data probabilities, wrong colours, preserve only height style. **Done**
- Inclusion of additional images. Additional images would mean a new layer. XML file and whole other info is needed. Those images need to be defined so the layers can be implemented. **Done**

Maybe duplication of information with the images provided by Klemen. However as this is a true colour image of the region, this could be helpful. Klemen is providing the ash images by subtracting thermal channels. What would be desirable for the overall project, not just ash / SO₂, are perhaps MERIS images that provide better true colour images than MODIS.

- New project (Etna) was proposed to be opened for additional testing of WP2. **Done**

2b) Deformation measurement

Task	7-12/07	1-6/08	7-12/08	1-6/09	7-12/09	1-6/10
selection of satellite data DONE	[Progress bar]					
CAT-1 proposals for satellite data DONE	[Progress bar]					
order of satellite data DONE	[Progress bar]					
definition of interfaces to related WPs & DB DONE	[Progress bar]					

adaption of PSI system for TS-X and ALOS DONE,	
literature review on suitable techniques DONE	
regular data order, acquisition, processing DONE hopefully	
development & prototyping of algorithms DONE	
implementation of interfaces DONE	
interaction with and support for GFZ DONE	
definition of final processing procedure DONE hopefully	
generation of final interferometric data sets DONE	
input of data sets into project's DB DONE	

Science: combine different line of sight measurements. Preliminary results are currently be improved. Combine observations with different resolution from different satellite platforms.

GIS interface:

- Data transfer still manual? Solved, as processing requires a lot of manual work, there is no way to process the INSAR images automatically. As this is done manually the images are also manually copied onto an FTP server where a routine from H.-P. checks on a regular basis if a new image is available.
- Certain style for the coherence transparency display, only data with high coherency should be displayed. Possible solution: Provide images with 0.5, 0.7 coherence values only being displayed. This is provided as a separate image. Done
- Problem with the KML file, most likely easy to fix. Done
- PSI Data should work but it needs to be tested. Done
- Corner reflector display, extra layer in the INSAR system. If more than 1 corner reflector is in image then number them. Also applicable to WP Insar ground based.
- Correct the metada (it has to be written that the shown values are velocity – mm per year).

2c) Thermal hotspots

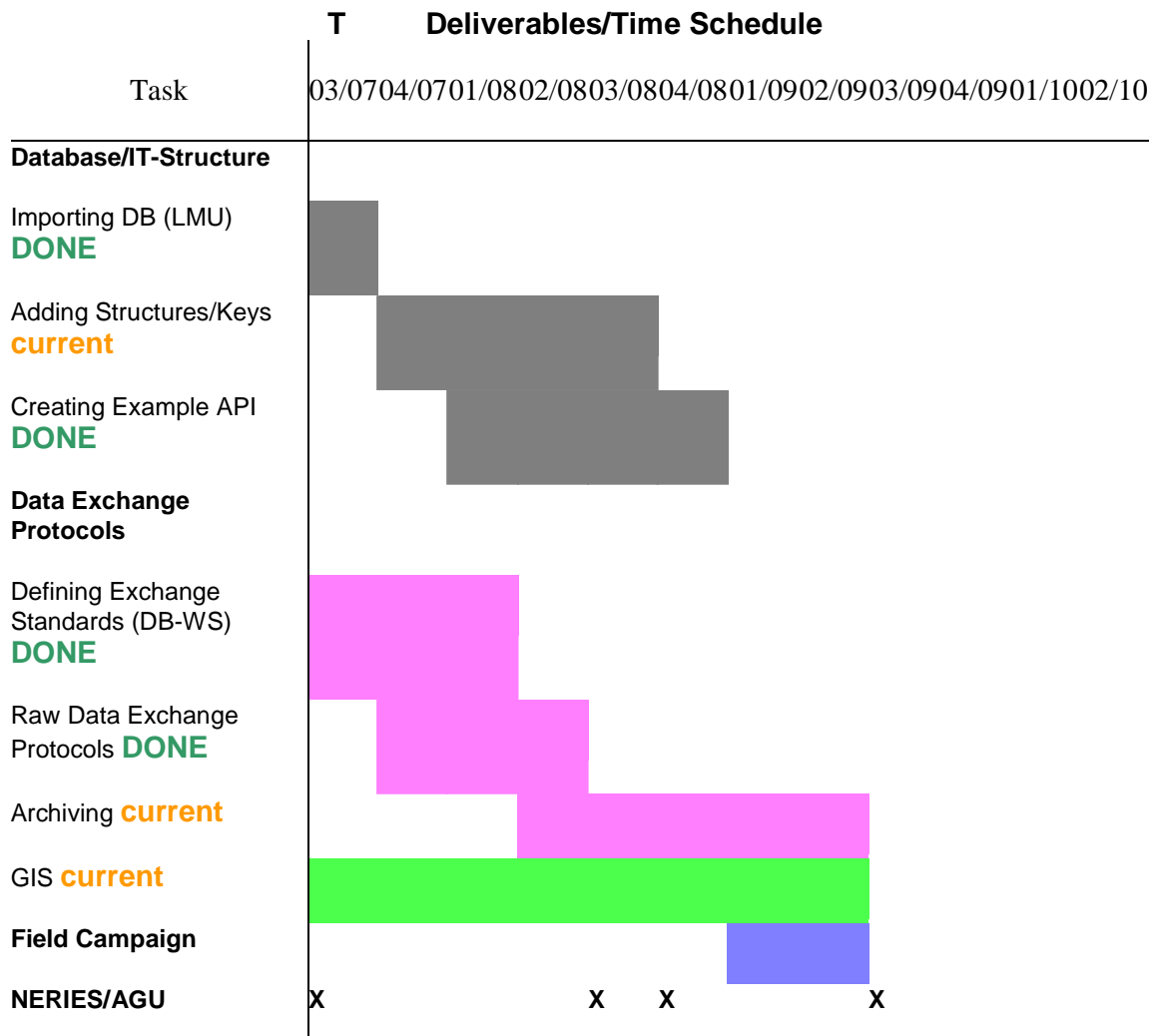
Task	7-12/07	1-6/08	7-12/08	1-6/09	7-12/09	1-6/10
MODIS functionality for the VFRS DONE						
Aquire Bird data DONE						
Implement bi-spectral method DONE						
Processing of Bird data DONE						

Science: Use of Kalman Filter to combine images from different observation platforms, improve temporal resolution, ash could tracking.

GIS interface:

- Thermal images. 16 bit images do not function yet. **Done**
- Note somewhere (the best in the GIS metadata that open each time you add layer) that the colours of the images are not the same in each image. Otherwise this may lead to confusion. **Done**
- Correct the time filter when adding the data to select from a single time instead from a time range.

Workpackage 3: Data base



User management system: Still pending agreed that user management would be desirable for the GIS system as well as for the data base but low priority at the moment.

GIS interface for seismic data

- Functionality was checked. Generally looks good, but some important details are still missing:
 - data quality not yet shown, **Done**.
 - station information does not work. **Done**,
 - styles for seismic events are not yet implemented. See WP5
- Beach Balls are implemented. Which information out of the XML-file should be displayed? **This needs to be defined (see WP5)**.
- Filter for seismic events: maybe not necessary because there is a colour scale for event types. **solved**
- Seismic events: the attributes that are suggested by Joachim (we know it is difficult to implement but necessary) are necessary. Need to be implemented. **Solved**
- Display time quality, data gaps, overlaps and how they evolve. Has to be connected to the GIS system. **Mapper needs to be written. WHO?**

3b Alert Levels

Task	T Deliverables/Time Schedule											
	03/07	04/07	01/08	02/08	03/08	04/08	01/09	02/09	03/09	04/09	01/10	02/10
Automatic Warning Levels												
Parameter Evaluation DONE	█											
HMM Training and State Evaluation DONE			█									
BBN Training current			█				█					
Simulation (virtual volcano) Not done!			█		█							
Combining HMM/BBN DONE			█		█							
Prototype Online Module DONE			█		█							



Science: further improvement of the Alert level algorithms.

GIS interface:

- Through java script direct access to Bayesian network in order to access the different probabilities. User can change the weights of the different input streams and can see how the actual alert level was computed. Nothing of this in implemented as of yet so this need to be checked thoroughly. **Solved through opening up a new window, two way process.**

Workpackage 4

Task	7-12/07	1-6/08	7-12/08	1-6/09	7-12/09	1-6/10
Task 1: Acquisition of WLAN components DONE						
Task 1: Testing of network configurations DONE						
Task 1: Prepara. of prototype installation DONE						
Task 1: Deployment of seismic stations DONE						
Task 1: Operation of seismic network DONE						
Task 1: Installation of WLAN DONE						
Task 1: VFRS test DONE						
Task 1: Assessment of the VFRS test current						
Task 2: Preparation of OB instruments DONE						
Task 2: Meteor ship cruise DONE						
Task 2: Recovery of instruments DONE						
Task 2: Data retrieval of OB instruments DONE						

Seishub input: Transfer functions of land experiment need to be supplied. Task:-> M. Hort, L. Krieger.

Workpackage 5 (Potsdam (Uni), Hamburg, Potsdam (GFZ))

Sub-Project	Year 1 (2007/08)		Year 2 (2008/09)		Year 3 (2009/10)	
	Term 1	Term 2	Term 1	Term 2	Term 1	Term 2
Multiparameter analysis and model building						

Task 1: synthetic database **DONE, data need to be included in data base**

X X

Task 1: real data test database DONE, need to be put into data base (offline, Arenal/Merapi volcano)	X	X				
Task 2: Implementation of realtime data analysis, wave field and activity parameters DONE	X	X	X	X		
Task2: Implementation of trigger algorithms and waveform cross correlation by master events DONE	X		X			
Task 2: event classification by HMM-spotting learning module / interactive operator interface current, finish Dec/June		X	X	X	X	
Task 2: detection message interface design In progress by Robert	X					
Task 2: test on synthetic and real data bases current, open end		X	X	X		
Task 3: Green function database generation tool current, description and format of greens functions	X					
Task 3: data processing scheme DONE	X					
Task 3: Development/Implementation of continuous CMT inversion for LP events DONE, so far not continuous, july 2010 cont.		X	X	X		
Task 3: Implementation of event-based moment tensor inversion for classified strong events DONE, test pending			X	X	X	
Task 3: Implementation strength / structure modelling by diffusion model & envelopes will probably not be accomplished (Wegler, Dahm???)						X
Task 4: Model geometry construction DONE	X	X				
Task 4: Inversion model development DONE		X	X			
Task 4: Forward model development DONE			X	X		
Task 4: Stress and pressure field computation DONE				X	X	X
Task 4: Real data applications current				X	X	X

Include all synthetic and real data into the database (Conny and Lars send them to J. Wassermann, K. Stammler).

General problem is the localization of events, still not perfect, improvement requires a lot of work -> potential for extension.

Implement a quality filter to display events.

Robert could perhaps program the input for time series of the event amplitude (min / max in 10 min time intervals) -> Joachim, clarify with Robert if he is willing to do it.

Potsdam (Hammer)

Detection by two systems. How is that solved? -> Robert (instead of H.P.) will hopefully do that, but no real solution.

Science: Improvement of the HMM algorithm

GIS interface for seismic data

- Display of the different events needs to be checked. Color coding scheme is defined. Robert is working on that. Color shows type of event. Event marker on the map has a default size if magnitude is available then size of marker is magnitude.
- In case a location is associated to the event it is displayed in the GIS via a color coding scheme.
- Event statistics will be provided to display number of events in an interactively chosen time range **the mapper is already done by S. Bernsdorf.**
- Time filter for seismic events is already included. Additional filter for event type and focal mechanism will be included.
- Info Box by clicking on an event, containing info on detection method, used stations, confidence level will be displayed.
- Display each five minutes min max values for seismic data in a window when clicking onto a station.

Hamburg (Krieger)

Science:

Green's functions (1D) for tests with synthetic data available
weighting functions and automatic restitution to be added.

Generation of 3D Green's functions in progress (IfG Code from Ekki)

Real data application in coordination and combination with Conny in progress

Proper visualisation of moment tensor solution to be tested (<-> Stefan)

Real time mode not working (yet)

Tests with several data sets (Merapi data, Azores data) planned (<-> Joachim)

GIS interface:

- XML scheme is ok.
- Robert wrote a script that will show the beach balls as PNG in the web GIS interface.
- Style moment tensor has to be included by Stefan.
- Check if the XML information provided by Lars is actually incorporated into the modified Quake-ML File ->**Robert has to do it.**

- Event filter choose also volcanic event types by a new **combo box**-> Lars, Conny together Stefan B.
- Add 2 **tic boxes**: for focal mechanism and focal mechanism with moment tensor.
- Provide the possibility of later addition of further external inversion/analysis by **html hyperlink** in **Meta-Info-Box** (currently to be set as **blind link**)

Potsdam (Shirzaei):

The user needs to interact with the modelling software, how could that be solved?

Science: Deformation: time dependend modeling is currently under review.

GIS Interface:

- How can we provide time series information of the 2D deformation. This is important information, solution unclear up to now. Maybe through an **AVI** which is generated by the software and then called via a **URL** which is displayed in the info box.
- Things would be nice to have but with a low priority. General time series display problem out of **GEOTIFF** and **KML** data files. For now we will just go for the time series of points written to **XML**.