Avalanche Studies and model Validation in Europe, SATSIE

Management Progress report

Rev. 1 — 12 December 2003
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Contact person: Maria Yeroyanni
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For the Norwegian Geotechnical Institute

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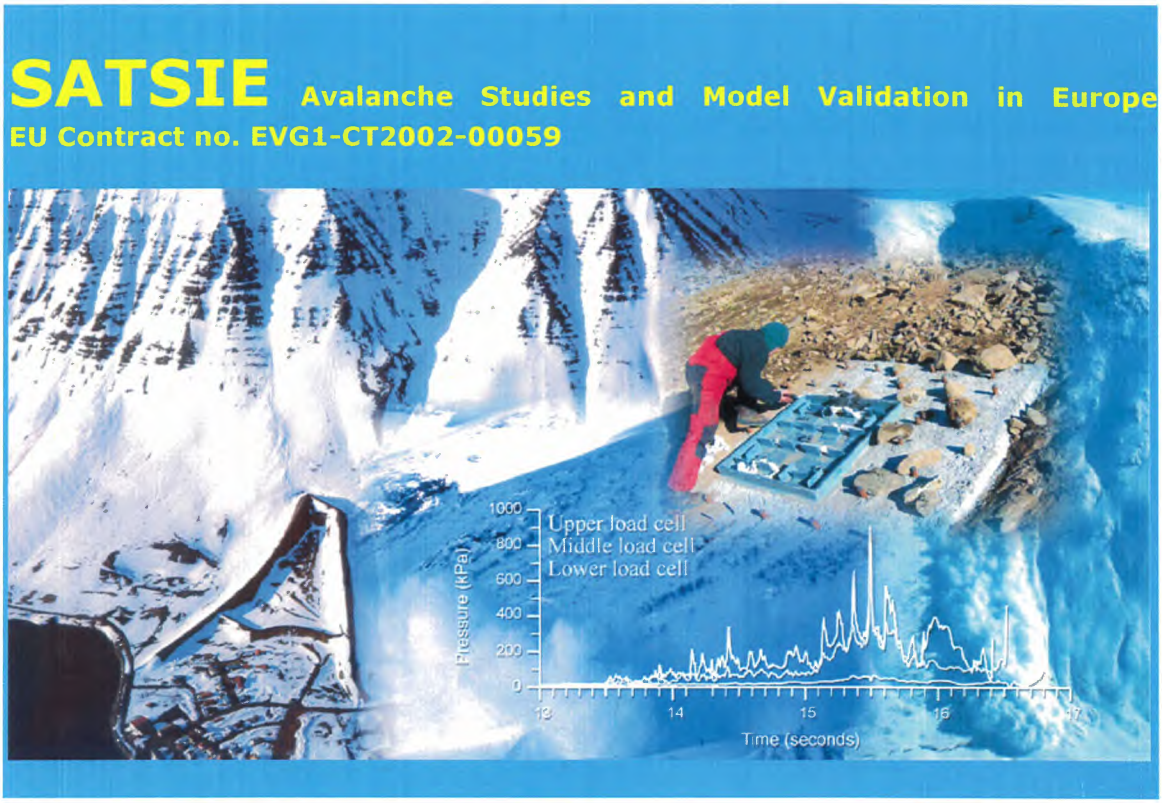


Management Progress Report. Revision 1.

Deliverable D1

12 December 2003

Reporting period: 1 October 2002 – 1 April 2003

Coordinator: Norwegian Geotechnical Institute

Home Page: *http://www.leeds.ac.uk/satsie/*

Contents

Review and reference document

1. Objectives of the reporting period

The SATSIE project is in good progress as all the participating partners are active in the development of sensors, methods and tests. The objectives of this report are to present an overview of the activities performed so far in the different work packages:

- WP 1: Sensor development
- WP 2: Data analysis techniques
- WP 3: Instrumentation
- WP 4: Measurement campaigns
- WP 5: Model development
- WP 6: Data sharing and dissemination

This report is Revision 1 of the Management Report, delivered to the Commission April 30. 2003. The revision is updated concerning Milestones, Deliverables, Gantt diagram and allocation of manpower and other costs to the different work packages. This information is therefore valid for two periods: 1st October 2002 – 30 March 2003, and 1st April 2003 – 30 September 2003.

2. Scientific/Technical progress made in the work packages

WP 1, Sensor development

Two types of radars are being developed: (1) a pulsed Doppler Radar for measurement of avalanche velocities, and (2) a frequency-modulated continuous-wave (FMCW) radar for investigation of the internal structure and velocities of avalanches. Both radars will be installed in the full-scale test site Ryggfonn in 2003.

Video methods for analysis of avalanche dynamics are under development with the main focus on colour or black-and-white systems, high-speed or high-resolution machine vision systems or digital camcorders, field cameras with more than 8-bit digitisation for better grey-level depth, multi-shuttering capabilities, and digitisation systems.

The Luminous Electric Diode technology (LED) has been used to determine the velocity profiles inside dense snow flows. A new system was designed, developed and tested, and is now installed at Lac Blanc Pass (CLB). During the winter 2002-2003, 20 experiments were performed.

Two tri-axial load plates, each with an area of 1 m², were designed, built and tested in the summer of 2002, and installed at the front of the catching dam in Ryggfonn in September 2002. The load plates measure shear stresses in two perpendicular axes in the plane of the dam front, and normal stress perpendicular to the dam front. The design load of the plates is 200 kN for shear stress and 400 kN for normal stress.

A snow rheometer for the study of the constitutive laws of snow is under development. A seismic sensor system is planned and will be installed in Ryggfonn in the summer of 2003.

WP 2, Data analysis techniques

One task comprises the development of algorithms and data-analysis techniques for the two different types of radar sensors: Pulsed Doppler radar and FMCW radar. Work on the design of algorithms (porting from existing radars), DSP-software development and PC-software development (data analysis and data representation) has begun. Over the next six months the design of the algorithms and the software will be completed and testing of the complete system started.

Video film clips have been partly processed. The software has been revised to deal with black and white images and an arbitrary number of change points. Over the next six months the plan is to re-digitise the videos with higher quality and to process more videos.

Work has been done on analysing the frequency response of an ultra-low differential pressure sensor system. A paper is to be written on the theory of air flow around and inside avalanches.

Discussions on impact pressure analysis have been carried out with SLF, Davos, on the current state of the art, and preliminary work started on the design of new algorithms.

Existing options for acquiring and consequent processing of avalanche seismic data are reviewed. In general, relatively little has been published in terms of the seismic detection and analysis techniques of avalanches.

In terms of choosing specific seismic data analysis software, it was decided to use the programs SAC and CORAL. As of the beginning of the year, the above mentioned software has been installed on an especially dedicated PC running under the Linux operating system.

On correlation methods, two papers have been written on the analysis and design of opto-electronic sensors. Software for calculating the correlations has been written and tested but is not yet ready for general distribution.

WP 3, Instrumentation

Full-scale avalanche test site Ryggfonn (Norway)

As mentioned in WP 1, two tri-axial load plates were installed at the front of the 16 m high retaining dam.

A continuous-wave Doppler radar was installed in Ryggfonn in February 2003 in order to compare it with the pulsed Doppler radar velocity measurements performed by AIATR, before the radar will be installed in Flateyri, Iceland.

A new data acquisition system, Hottinger Baldwin MGC Plus, was installed in the autumn of 2002.

Protection dam system Taconnaz (France)

A system dedicated to measure avalanche impact forces was designed.. Two of the deflector walls, situated at the end of the flowing zone of the path will be equipped with instruments for measurements of impact forces in the summer of 2003. The walls are 1.5 m wide, 10 m long and 7 m high. Two three-components sensors and two data loggers (Campbell) were purchased.

Snow chute at Col du Lac Blanc

A feeding system which consists of a storage hopper with an Archimedes' screw was designed. The screw is 4 m long and its diameter is 60 cm. The flow channel is sitting on a beam whose inclination is adjustable from 27° to 45°. The channel length is 10 meters, its width 20 cm and its height 20 cm. Underneath, it has a double bottom where the electronically systems required for the sensors are installed. The sensors included in the channel measure: (i) the flow height, (ii) the normal and shear stresses at the bottom of the flow and (iii) the velocities inside the flow to get the velocity profile.

Pavia chutes

Chute A

The first channel has rectangular shape and is 35 cm wide and 6 m long, with a constant slope which can vary from 0° up to about 40°; the run-out zone is represented by the ground floor. The bed of the channel is metallic and the lateral walls (50 cm high) are made of Plexiglas. A pneumatic gate is installed at the beginning of the channel.

Chute B

Chute B is 10.38 m long and 30 cm wide. The lateral walls are 30 cm high. It is made by two Plexiglas reaches: the first is 5 m long and the second is 5.38 m long. The difference between the two slopes can be highly variable. This channel will be mainly employed to study bed erosion and deposition phenomena, and flow regime transition related to slope changes. In order to

measure the time evolution of the granular mass, 3 high speed digital cameras, connected to computers, have been purchased.

Bristol chute

A digital depth sensor has been purchased for installation in the chute at the University of Bristol.

WP 4, Measurement campaigns

Ryggfonn

The winter season 2002-2003 was relatively dry, with snow depths less than normal and few naturally released avalanches. Several wet snow avalanches were released naturally in January. One avalanche hit the base of the dam. Impact pressures were recorded at the concrete structure and at the lower pressure plate at the dam.

In April 2003, one avalanche was triggered artificially and a small, dry avalanche was released. The avalanche hit the uppermost steel mast and the concrete structure, but stopped before the retaining dam was reached. Velocity data were obtained by the Pulsed Doppler Radar operated by AIATR. The data analysis is in progress.

Col du Lac Blanc chute

Results were obtained during the winter of 2002/2003 with flows of small rounded snow grains with various densities on the Cemagref chute located at Col du Lac Blanc. The velocity measurements are based on the system described in WP1 and WP3. The velocity distribution and shear rates for several tests were studied.

WP 5, Model development

A work package meeting in WP5 was held at the University of Leeds on 16-18 January 2003.Work is in progress to implement different types of internal avalanche models and compare it with historical avalanches. In snow entrainment and mass balance the work has consisted of preparations of model improvements. On powder snow avalanches preliminary experiments have been performed. Concerning Interactions with dams and impact loads it was decided to combine Task 2.4 with Task 5.4. The work in these tasks will be concentrated about the dynamics of the impact between avalanches and the obstacle in question (deflecting dam or a catching dam). Ongoing deflecting dam experiments at the University of Bristol are being interpreted. Testing and validation of model improvements will initially have to be based partly on existing data and partly on results of chute experiments because results from new field experiments will not be available in the first stages of the project.

WP 6, Data sharing and data archive

The proposal for the structure of the database and the data formats has been written and circulated.

A Web page and a web site document are developed. The document reports the work on the web-site up until 27th of March 2003. The web page has links to EU and 5th framework homepages. A counter indicates site usage and there is a link to a page that explains the montage image that dominates the front page. The bar below the image contains links to the *Objectives, Partners, Private, Links, Feedback* and *Project description* pages.

Gantt chart update

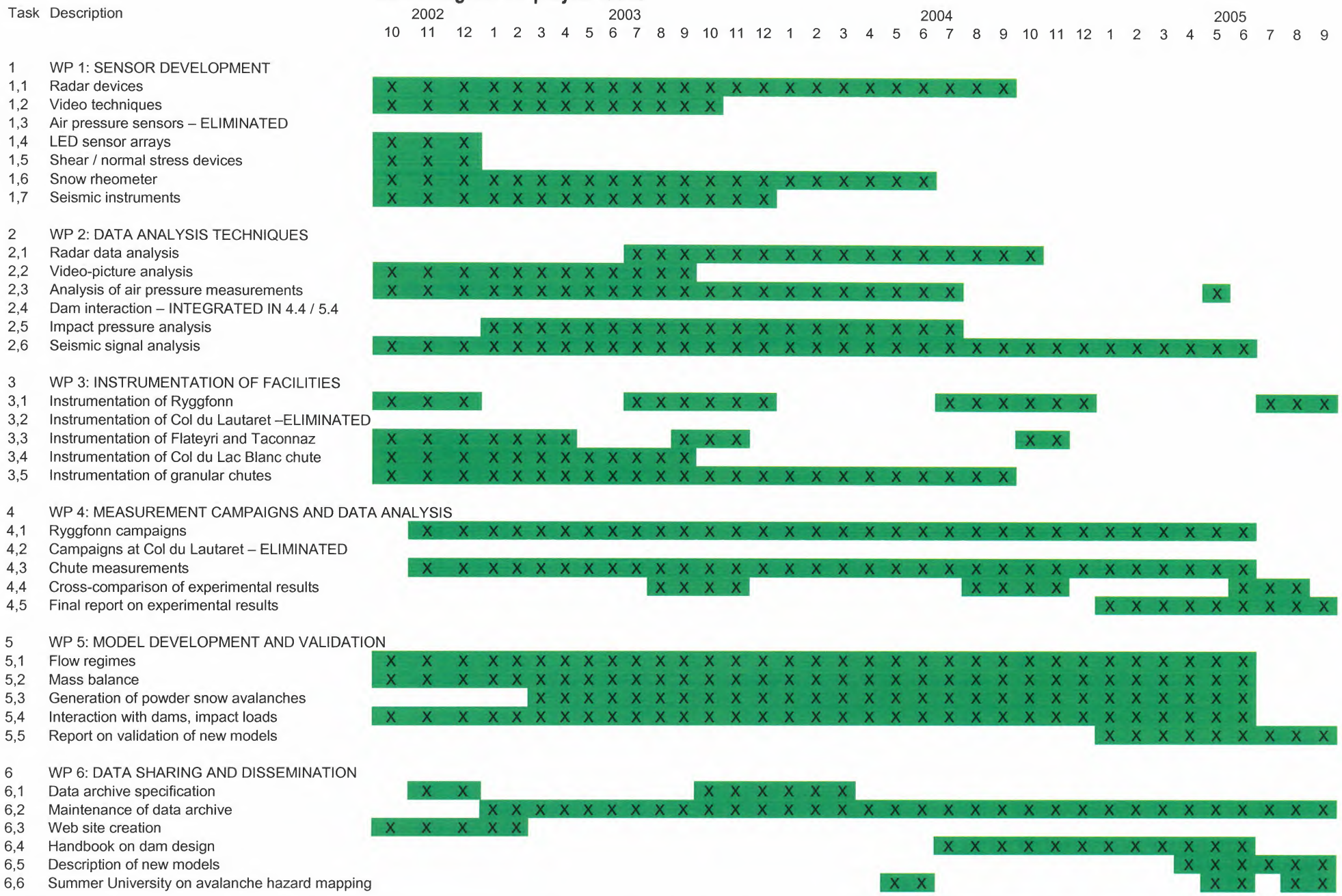
An updated Gantt chart is presented on page 6. The first Gantt chart was made for the original proposal. The project budget was reduced to 60% of the original proposed, and the duration of the project from 4 to 3 years. The Gantt chart had therefore to be changed substantially for several tasks. It now presents a realistic time schedule of the different tasks.

Table with comparison between planned and used manpower and financial resources

Two tables showing planned and used manpower, in personnel months (PM), and other costs in €, are presented at page 7 and 8[1)]. There is an overall good agreement between planned and used resources, both concerning manpower and other costs. As a whole, the consortium has used 0,84 personnel months less than planned in the first half year of the project, and 0,48 less in the second half year. As for the other costs, the total use have been 19654 € less in the first period and 686 € in the last. None of the partners have major differences between planned and used resources.

1:Note that the partners no. 4 SGUL and no. 3 DAMTP have shifted location in the tables at page 7 and 8, compared to the official numbering of the partners, where SGUL is no.3 and DAMTP is no.4.

Gantt diagram for project tasks



SATSIE: Resource use (personnel / O.costs) **Reporting period: October 1, 2002 – March 31, 2003** PM: Personnel months O. costs: Other costs in Euro

Partner		1		NGI		2		IMOR		3		DAMTP		4		SGUL		5		AIATR		6		INW		7		ETNA		8		DIIA		9		DGG	Tot.pers.	Total
		PM		O.costs		PM		O.costs		PM		O.costs		PM		O.costs		PM		O.costs		PM		O.costs		PM		O.costs		PM		O.costs		PM		O.costs	months	O.costs
Coor-	*planned*	1,00		3000,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00	**1,00**	**3000,00**
dination	*used*	0,60		3968,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00	**0,60**	**3968,00**
	Diff.	-0,40		968,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00	**-0,40**	***968,00***
WP 1	*planned*	4,00		60000,00		0,00		0,00		0,00		0,00		0,00		0,00		1,25		1300,00		6,60		20000,00		2,40		1000,00		0,00		0,00		1,00		14600,00	**15,25**	**96900,00**
	used	3,40		60159,00		0,00		0,00		0,00		0,00		0,00		0,00		1,00		1090,00		7,00		12047,14		2,40		1000,00		0,00		0,00		1,00		9160,43	**14,80**	**83456,57**
	Diff.	-0,60		159,00		0,00		0,00		0,00		0,00		0,00		0,00		-0,25		-210,00		0,40		-7952,86		0,00		0,00		0,00		0,00		0,00		-5439,57	**-0,45**	**-13443,43**
WP 2	*planned*	0,50		0,00		0,00		0,00		4,00		5000,00		0,00		0,00		0,00		0,00		1,00		0,00		0,00		1000,00		0,00		0,00		5,00		1100,00	**10,50**	**7100,00**
	used	0,00		0,00		0,00		0,00		4,00		3608,43		0,00		0,00		0,00		0,00		1,00		0,00		0,00		1000,00		0,00		0,00		4,00		1758,09	**9,00**	**6366,52**
	Diff.	-0,50		0,00		0,00		0,00		0,00		-1391,57		0,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00		-1,00		658,09	**-1,50**	**-733,48**
WP 3	*planned*	2,00		4000,00		0,00		24120,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00		8,00		1800,00		1,00		2500,00		0,00		200,00	**11,00**	**32620,00**
	used	0,90		3505,00		0,00		21384,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00		8,00		1758,50		1,10		2148,18		0,00		0,00	**10,00**	**28795,68**
	Diff.	-1,10		-495,00		0,00		-2736,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00		-41,50		0,10		-351,82		0,00		-200,00	**-1,00**	**-3782,82**
WP 4	*planned*	1,80		3500,00		2,50		5000,00		0,00		0,00		0,00		2100,00		1,00		2450,00		0,00		0,00		10,00		2000,00		1,17		1750,00		0,00		200,00	**16,47**	**17000,00**
	used	2,20		3534,00		2,50		3124,00		0,00		0,00		0,00		0,00		0,49		0,00		0,00		0,00		10,00		2000,00		1,27		1503,72		0,00		0,00	**16,46**	**10161,72**
	Diff.	0,40		34,00		0,00		-1876,00		0,00		0,00		0,00		-2100,00		-0,51		-2450,00		0,00		0,00		0,00		0,00		0,10		-246,28		0,00		-200,00	**-0,01**	**-6838,28**
WP 5	*planned*	1,50		3200,00		0,00		3000,00		2,00		0,00		0,00		167,00		0,00		0,00		0,00		0,00		1,50		0,00		1,83		250,00		0,00		100,00	6,83	6717,00
	used	2,80		3457,00		0,00		2624,00		2,00		0,00		0,00		138,93		0,00		0,00		0,00		0,00		1,50		0,00		2,00		214,82		0,00		897,48	8,30	7332,23
	Diff.	1,30		257,00		0,00		-376,00		0,00		0,00		0,00		-28,07		0,00		0,00		0,00		0,00		0,00		0,00		0,17		-35,18		0,00		797,48	1,47	615,23
WP 6	*planned*	0,10		0,00		0,00		0,00		0,00		0,00		0,00		503,00		0,00		0,00		0,00		0,00		0,00		0,00		0,50		500,00		0,00		0,00	**0,60**	**1003,00**
	used	0,10		0,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00		0,00		0,55		429,64		0,00		0,00	**0,65**	**429,64**
	Diff.	0,00		0,00		0,00		0,00		0,00		0,00		0,00		-503,00		0,00		0,00		0,00		0,00		0,00		0,00		0,05		-70,36		0,00		0,00	**0,05**	**-573,36**
Total	*planned*	10,90		73700,00		2,50		32120,00		6,00		5000,00		0,00		2770,00		2,25		3750,00		7,60		20000,00		21,90		5800,00		4,50		5000,00		6,00		16200,00	61,65	164340,00
	used	10,00		74623,00		2,50		27132,00		6,00		3608,43		0,00		138,93		1,49		1090,00		8,00		12047,14		21,90		5758,50		4,92		4296,36		5,00		11816,00	59,81	140510,35
	Diff.	-0,90		923,00		0,00		-4988,00		0,00		-1391,57		0,00		-2631,07		-0,76		-2660,00		0,40		-7952,86		0,00		41,50		0,42		-703,65		-1,00		-4384,00	-1,84	-23746,65

SATSIE: Resource use (personnel / O.costs) **Reporting period:** **April 1, 2003 - September 30, 2003** PM: Personnel months O. costs: Other costs in Euro

Partner		1 NGI		2 IMOR		3 DAMTP		4 SGUL		5 AIATR		6 INW		7 ETNA		8 DIIA		9 DGG	Tot.pers.	Total
		PM	O.costs	PM	O.costs	PM	O.costs	PM	O.costs	PM	O.costs	PM	O.costs	PM	O.costs	PM	O.costs	PM	O.costs	months	O.costs
Coor-dination	*planned*	0,60	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,60	0,00
	used	0,20	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,20	0,00
	Diff.	-0,40	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	-0,40	0,00
WP 1	*planned*	1,40	24000,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	6,00	7000,00	2,40	1000,00	0,00	0,00	1,00	100,00	10,80	32100,00
	used	1,50	23619,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	5,50	11516,33	2,40	1000,00	0,00	0,00	0,75	677,89	10,15	36813,22
	Diff.	0,10	-381,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	-0,50	4516,33	0,00	0,00	0,00	0,00	-0,25	577,89	-0,65	4713,22
WP 2	*planned*	0,00	0,00	0,00	0,00	4,00	5000,00	0,00	0,00	0,00	0,00	2,00	0,00	0,50	1000,00	0,00	0,00	3,00	2699,00	9,50	8699,00
	used	0,00	0,00	0,00	0,00	4,00	4370,34	0,00	0,00	0,00	0,00	1,50	0,00	0,50	1000,00	0,00	0,00	2,00	2751,92	8,00	8122,26
	Diff.	0,00	0,00	0,00	0,00	0,00	-629,66	0,00	0,00	0,00	0,00	-0,50	0,00	0,00	0,00	0,00	0,00	-1,00	52,92	-1,50	-576,74
WP 3	*planned*	1,00	1000,00	0,50	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	1500,00	1,00	2500,00	1,00	1700,00	3,50	6700,00
	used	0,30	915,00	0,50	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	1360,00	1,10	2148,18	2,25	4471,40	4,15	8894,58
	Diff.	-0,70	-85,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	-140,00	0,10	-351,82	1,25	2771,40	0,65	2194,58
WP 4	*planned*	0,50	0,00	0,00	0,00	0,00	0,00	0,00	9859,00	1,50	7750,00	0,00	0,00	0,50	1000,00	1,17	1750,00	1,00	1200,00	4,67	21559,00
	used	0,50	0,00	0,00	0,00	0,00	0,00	0,00	779,83	2,85	8390,00	0,00	0,00	0,50	1000,00	1,27	1503,72	0,50	0,00	5,62	11673,55
	Diff.	0,00	0,00	0,00	0,00	0,00	0,00	0,00	-9079,17	1,35	640,00	0,00	0,00	0,00	0,00	0,10	-246,28	-0,50	-1200,00	0,95	-9885,45
WP 5	*planned*	0,50	0,00	3,00	4000,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	4,50	1600,00	1,83	250,00	0,00	100,00	9,83	5950,00
	used	0,40	0,00	3,00	8951,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	4,50	1587,43	2,00	214,82	0,50	2041,07	10,40	12794,32
	Diff.	-0,10	0,00	0,00	4951,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	-12,57	0,17	-35,18	0,50	1941,07	0,57	6844,32
WP 6	*planned*	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,20	0,00	0,50	500,00	0,00	0,00	0,70	500,00
	used	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,20	0,00	0,55	429,64	0,00	0,00	0,75	429,64
	Diff.	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,05	-70,36	0,00	0,00	0,05	-70,36
Total	*planned*	4,00	25000,00	3,50	4000,00	6,00	5000,00	0,00	9859,00	1,50	7750,00	8,00	7000,00	8,10	6100,00	4,50	5000,00	6,00	5799,00	41,60	75508,00
	used	2,90	24534,00	3,50	8951,00	6,00	4370,34	0,00	779,83	2,85	8390,00	7,00	11516,33	8,10	5947,43	4,92	4296,36	6,00	9942,28	41,27	78727,56
	Diff.	-1,10	-466,00	0,00	4951,00	0,00	-629,66	0,00	-9079,17	1,35	640,00	-1,00	4516,33	0,00	-152,57	0,42	-703,65	0,00	4143,28	-0,33	3219,56

3. Milestones and deliverables obtained

Deviations from the work plan

An updated list of the project milestones and deliverables is shown below. The original table of milestones assumed that SATSIE would begin on 1st June 2002. With the actual starting date on 1st October 2002, most dates had to be shifted four months into the future. However, several milestone dates depend on the winter season. In some of those cases, the objectives connected to specific milestones had to be adjusted. In the following, only milestones that had to be adjusted by more than 4 months due to delays in the work will be commented on.

M1.4 Due to the later starting date of the project, preliminary work on avalanche image analysis (Task 2.2) needed as input could not be completed before the winter 2002/03.

M1.6 Due to severe illness in the main contributor's nearest family and unforeseen technical difficulties, work was delayed. Chances are good that the FMCW radar systems will nevertheless become operational in time for the winter season.

M1.8 Adaptation of earlier designs was easier than anticipated.

M1.10 No significant changes had to be made to the existing design.

M1.11 If necessary, design changes will be made on the basis of experience from the first winter.

M2.5 Correction of misprint. Original date is retained.

M3.1 Inventory was integrated into 1st Annual Report.

M3.2 Inventory was integrated into 1st Annual Report.

M5.1 Conclusions from preparatory work (e.g., paper on comparison of existing avalanche models using measured avalanches at the Ryggfonn site) are delayed due to involvement in SATSIE experiments or insufficient working capacity at some partner institutions.

M6.2 It was decided to build on the avalanche database from the EU project CADZIE, but delays in closing CADZIE work and legal uncertainties (copyrighted maps) have made it impossible so far to use that database.

The only delays necessitating corrective action because of their effect on the entire project are those in M5.1 and M6.2:

- Model development will be given high priority during all of 2004, and the main decisions on how to take into account flow regime changes and entrainment will be taken at a dedicated workshop in early 2004.

- The decision on whether to adopt and adapt a truncated version (without the copyrighted maps) of the CADZIE database or to develop a new one will be taken by the end of 2003, pending negotiations with the CADZIE consortium. This will allow the common SATSIE data archive to become operational in the course of the winter 2004.

Project planning and time table – List of milestones

No.	Date	Content	Tasks
M0.1	30.04.2003	Deliverable D1 (Management progress report #1)	
M0.2	30.11.2003	Deliverable D3(1st Annual scientific report)	
M0.3	30.04.2003	Deliverable D4 (Management progress report #2)	
M0.4	30.04.2004	Deliverable D5 (Midterm review meeting)	
M0.5	30.11.2004	Deliverable D7 (2nd Annual scientific report)	
M0.6	30.04.2005	Deliverable D9 (Management progress report #3)	
M0.7	30.11.2005	Deliverable D17 (Final scientific report)	
M0.8	30.09.2005	Deliverable D16 (Technology Implementation Plan)	
M1.1	31.08.2002	Shear/normal stress plates ready for tests	T1.5
M1.2	31.10.2002	Prototype LED sensors ready for tests	T1.4
M1.3	31.10.2002	Snow rheometer ready for tests	T1.6
M1.4	30.09.2003	Video locations and recording strategies selected	T1.2
M1.5	30.10.2003	Seismic equipment ready for tests	T1.7
M1.6	15.12.2003	Prototype frequency-stepping radar ready for first tests	T1.1
M1.7	31.10.2003	Prototype pulsed Doppler radar ready for basic testing	T1.1
M1.8	30.09.2002	Shear/normal stress plates ready for installation	T1.5
M1.10	31.12.2002	LED sensor arrays ready for installation	T1.4
M1.11	30.10.2004	Improved design of frequency-stepping radar	T1.1
M1.12	31.12.2003	Prototype pulsed Doppler radar ready for operational use	T1.1
M1.13	31.05.2004	Deliverable D6 (together with WP 2)	T1.1T1.7
M2.1	31.12.2002	Review of current techniques, proposals for improving measurements	T2.1T2.6
M2.2	31.05.2003	Beta software and algorithms for data analysis completed	T2.1T2.6
M2.3	31.07.2003	Review of data analysis with proposals for improving measurements	T2.1T2.6
M2.4	31.05.2004	Version 1 software and algorithms for data analysis completed	T2.1T2.6
M2.5	30.09.2004	Deliverable D6 (together with WP 1)	T2.1T2.6
M2.6	31.07.2004	Review of data analysis, proposals for improving measurements	T2.1T2.6
M2.7	31.05.2005	Version 2 software and algorithms for data analysis completed	T2.1T2.6
M3.1	30.09.2003	Inventory of needed measurements and existing instrumentation	T3.1T3.5
M3.2	30.09.2003	Inventory of the existing laboratory facilities	T3.4T3.5
M3.3	30.09.2003	Plan for extended instrumentation of the Ryggfonn site	T3.1T3.5
M3.4	31.10.2003	Instrumentation maintenance after winter 2003	T3.1T3.3
M3.5	31.10.2004	Instrumentation maintenance after winter 2004	T3.1T3.3
M3.6	30.11.2004	Installation of instrumentation at Ryggfonn completed	T3.1T3.5
M3.7	30.11.2004	Deliverable D8: Update of overview report on European avalanche test sites	T3.1T3.5
M3.8	31.08.2005	Deliv. D10: Documentation of instrumentation scheme and installation work	T3.1T3.5
M3.9	30.06.2005	Instrumentation maintenance after winter 2005	T3.1T3.3
M4.1	31.05.2003	Summary of experiments during Winter 2003	T4.1T4.4
M4.2	31.07.2003	Preliminary analysis and comparison updated experimental plan	T4.1T4.4
M4.3	30.09.2003	Exp. data from winter 2003 processed and archived	T4.1T4.3

No.	Date	Content	Tasks
M4.4	30.12.2003	Data from chute experiments 2003 summarised, processed and archived	T4.4
M4.5	31.05.2004	Summary of experiments during Winter 2004	T4.1T4.3
M4.6	31.07.2004	Preliminary analysis and comparison updated experimental plan	T4.1T4.4
M4.7	31.08.2004	Exp. data from winter 2004 processed and archived	T4.1T4.3
M4.8	30.09.2004	Chute experiments 2004 summarised, processed and archived	T4.4
M4.9	31.05.2005	Summary of experiments during Winter 2005	T4.1T4.3
M4.10	30.09.2005	Deliverables D11, D12	T4.4,
M5.1:	30.04.2004	Preliminary reports on model development	T5.1T5.4
M5.2:	31.10.2004	Updated reports on model development	T5.1T5.4
M5.3:	30.04.2005	Summary report on the validation of the new models	T5.5
M5.4	31.07.2005	Deliverable D13 (new models of specific processes as modules to existing	T5.1T5.4
M6.1	31.01.2003	Deliverable D1: SATSIE web site established	T6.3
M6.2	31.03.2004	Data format for SATSIE data archive defined	T6.1
M6.3	30.09.2003	Preprocessed data from winter 2003 archived	T6.2
M6.4	30.09.2004	Preprocessed data from winter 2004 archived	T6.2
M6.5	31.05.2005	Raw data from winter 2005 archived	T6.2
M6.6	30.05.2004	First circular for Summer University 2005 sent out	T6.6
M6.7	31.08.2005	Deliverable D14: Handbook on design of protection dams	T6.4
M6.8	31.08.2005	Deliv. D15: User manuals for advanced models in avalanche hazard mapping	T6.5
M6.9	30.04.2005	Deliverable D18: Teaching materials for Summer University 2005	T6.5,

Deliverables list

Deliverable No.	Responsible partner	Deliverable title	Delivery date (month)	Nature	Dissemination level
1	SGUL, DAMTP	Web site and meta-data archive	6	Da	PU/CO
2	NGI	Management progress report #1	7	Re	CO
3	NGI	1st Annual scientific report and related materials	14	Re	CO
4	NGI	Management progress report #2	19	Re	CO
5	NGI	Mid-term review meeting	19	Meeting	
6	ETNA, DAMTP	Summary publication on sensor design and data analysis techniques	24	Re	RE
7	NGI	2nd Annual scientific report and related materials	26	Re	CO
8	DIIA	Updated report on European avalanche test sites	30	Re	PU
9	NGI	Management report #3	31	Re	CO
10	DIIA	Documentation of instrumentation scheme and installation work at the selected sites	35	Re	PU
11	SGUL	Summary publication on results from small and large-scale experiments	36	Re, Da	PU
12	SGUL	Summary publication on avalanche / dam interaction measurements	36	Re, Da	PU
13	IMOR, NGI, DIIA, SGUL DAMTP,	Models of specific processes in avalanche flow and sample modules for inclusion in numerical codes	34	Re. Th, De	PU/CO
14	IMOR	Handbook on deflection and catching dam design	35	Re	PU
15	IMOR, NGI, DIIA, SGUL DAMTP	User manuals for advanced models in avalanche hazard mapping	35	Re	PU
16	NGI	Final scientific report and related materials	37	Re	CO
17	NGI	Technology Implementation Plan	37	Re	CO
18	ETNA	European Summer University 2005 on use of advanced models in avalanche hazard mapping	36	O	PU

4. Coordination of the information

Information exchange between the partners is mainly based on the following types:

- Telephone
- e-mail
- SATSIE homepage (http://www.leeds.ac.uk/satsie)
- reports
- papers
- meetings
- conferences
- contacts with other projects

Coordinated e-mails, i.e. e-mails between the coordinator and all partners, plus e-mails among the partners, are the most common type of communication. In addition, telephone communication is common. Communication has been effective, all partners are in close contact, and the response time on e-mails between the partners is short. The knowledge in the consortium of the activities of the different partners is high, and there is a high degree of informal communication concerning scientific work and results. Eight scientific papers have been presented at scientific conferences and submitted for publication.

Three coordination meetings, and one workshop, which all have contained an important scientific part, have been arranged:

- Start-up meeting, Cambridge, September 2002
- Co-ordination meeting, Davos, June 2003. Combined with an international scientific meeting, organised by IGS, the International Glaciological Society
- Coordination meeting, Pavia, September 2003
- Workshop meeting in WP 5, Leeds, January 2003

Detailed minutes from the meetings are circulated among the partners and placed on the SATSIE homepage. A comprehensive description of the project is found on the homepage. The homepage serves as an effective means of communication between the partners.

Several persons and organisations outside the consortium participate in the research work done in SATSIE.

- Prof. Margarita E. Eglit, Faculty of Mechanics and Mathematics, Lomonossov Moscow State University, Russia. Assigned to the project for a period of three months on a special funding.
- Dr J. M. Nico T. Gray, Department of Mathematics, University of Manchester, U.K.
- Dr Andrew J. Hogg, Department of Mathematics, University of Bristol, U.K.
- Dr Kouichi Nishimura, Nagaoka Institute of Snow and Ice Studies, National Research Institute for Earth Science and Disaster Prevention, Japan
- Dr. Betty Sovilla, Eidg. Institut für Schnee- und Lawinenforschung, Davos, Switzerland
- Prof. Fridtjov Irgens, Norwegian Technical University, Trondheim, Norway

5. Management difficulties

The coordinator finds no difficulties in the management and the co-ordination of the project. Effective communication by e-mail, well arranged meetings, and good planning of the work by the participants, combined with a high degree of motivation and skill, makes the management of the consortium effortless.

The communication between the European Commission and the coordinator could be improved. There seems to be little time to follow up the project by the Commission. The consortium would appreciate more initiatives from the Commission concerning informal contacts, where information could be exchanged between the Commission and the coordinator, especially about the reporting. More specific guidelines should be given directly to the coordinator in this respect, to avoid misunderstandings and waste of time. The consortium is surprised that it lasted eight months from submission of the Management Report until the first reaction from the Commission was received. A shorter response time would have saved time on the reporting, time which could have been used more profitably on scientific work.

Kontroll- og referanseside/
Review and reference page

NGI

Oppdragsgiver/*Client* European Commission **Kontraktsreferanse/ *Contract reference*** Contract of 18.10.2002	**Dokument nr/*Document No.*** 20021048-2 Rev. 1 **Dato/*Date*** 2003-12-12
Dokumenttittel/*Document title* Avalanche Studies and model Validiation in Europe, SATSIE **Prosjektleder/*Project Manager*** Karstein Lied **Utarbeidet av/*Prepared by*** Karstein Lied	**Distribusjon/*Distribution*** ☑ **Fri/*Unlimited*** ☐ **Begrenset/*Limited*** ☐ **Ingen/*None***
Emneord/*Keywords* Snow avalanches, full scale and small scale tests, dynamical models	
Land, fylke/*Country, County* Several **Kommune/*Municipality*** Several **Sted/*Location*** Several **Kartblad/*Map*** **UTM-koordinater/*UTM-coordinates***	**Havområde/*Offshore area*** **Feltnavn/*Field name*** **Sted/*Location*** **Felt, blokknr./*Field, Block No.***

Kvalitetssikring i henhold til/*Quality assurance according to* NS-EN ISO9001

Kontrollert av/ *Reviewed by*	Kontrolltype/ *Type of review*	Dokument/*Document*		Revisjon 1/*Revision 1*		Revisjon 2/*Revision 2*	
		Kontrollert/*Reviewed*		Kontrollert/*Reviewed*		Kontrollert/*Reviewed*	
		Dato/*Date*	Sign.	Dato/*Date*	Sign.	Dato/*Date*	Sign.
for DI	Helhetsvurdering/ *General Evaluation* *	5/1-04	FS				
	Språk/*Style*						
for DI	Teknisk/Technical - Skjønn/*Intelligence*	5/1-04	FS				
	- Total/*Extensive*						
	- Tverrfaglig/ *Interdisciplinary*						
KHe	Utforming/*Layout*						
KL	Slutt/*Final*						
JGS	Kopiering/*Copy quality*	6/1-04					

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