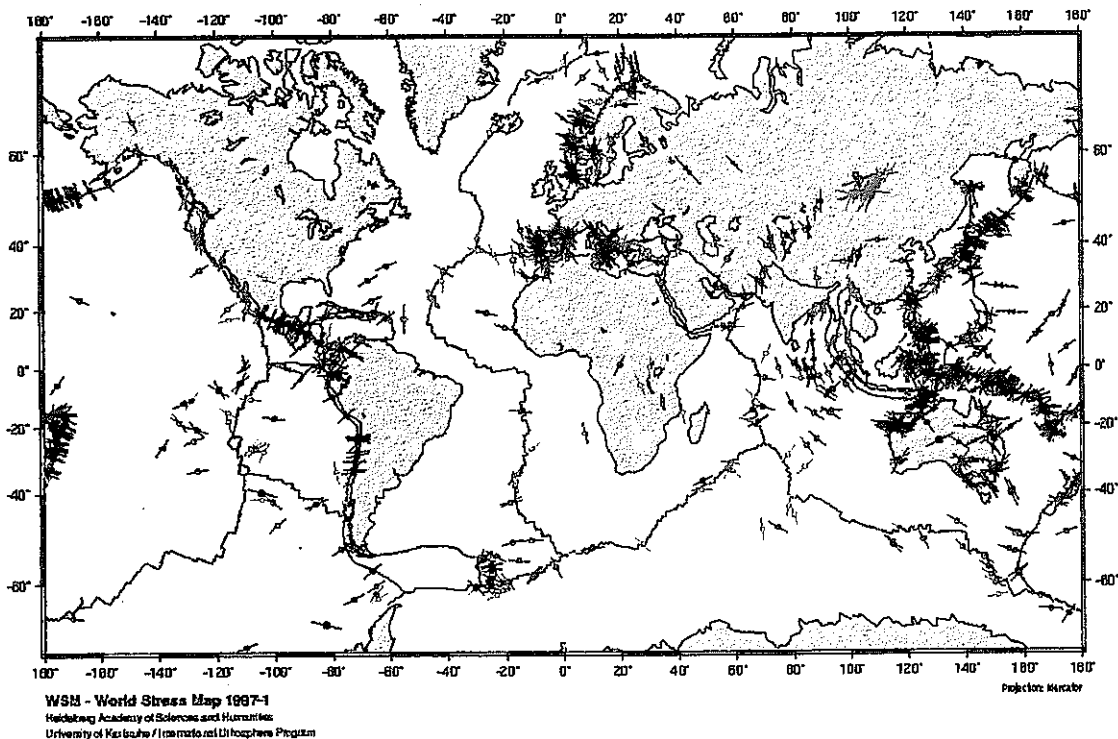


FINAL REPORT

to

Tono Geoscience Center



December 16, 1998
Opus 116

Göran Bäckblom
JNC International Fellow
March 12 1997 - December 22, 1998

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1 INTRODUCTION AND ACKNOWLEDGEMENTS

I am truly grateful for the opportunity to work in Japan and share experiences on R&D for nuclear waste management. The work as International Fellow has been very interesting and also of mutual benefit I think. My stay in Japan has also been very convenient due to all practical arrangements made by JNC.

I would like to express my sincere gratitude to great many colleagues that have supported and enlightened me. They have also educated me in Japanese customs and matters while occasionally patiently listening to the incomprehensible beginners Japanese. Not the least - they have endured all those wordy documents that focus on "*this should be changed..., this must be improved..., do not forget..., why have you.... I do not understand... etc.*"

Domou arigatou gozaimashita!!!

This section is not complete and I sincerely apologize for not making it longer. However there is need to say a special *arigatou* to Mr Sakuma for the invitation to come to Japan, for his mentor- and friendship, to Dr Yusa and his family for being a good neighbour and supporter in my work, to Dr Yoshida for stimulating discussions and exchange, to my managers Mr Osawa, Dr Takeda, Mr Sugihara and Mr Yamamoto for their patience and interest, to Dr Tsubota for all field trips and introduction to the board game *Go*, to Mr Nishida for being an extraordinary helpful colleague and neighbour, to Mr Takahashi -without his help I would have been lost in ArcView -, to Mr Saito who introduced me to the Japanese nature, to Dr Umeki and Mr Miyahara, patiently commenting on wordy documents, to Dr Yamakawa for being a good colleague and friend, to Mr Uchida for good communications, to Mr Aoki and his family for all enjoyable Kamaishi-experiences -and last but not least to all efficient secretaries and nice company drivers supporting the daily work by superb and elegant services.

Domou arigatou gozaimashita!!!

2 DELIVERABLES

My written contributions during March 1997 - Dec 1998 are documented in Notes. All notes and technical information are filed in paper files and on a cd. The *readme.html* for the cd is appended to this note. The List of Notes is also appended in paper for convenience.

The contents of the Final Report were presented at a Seminar at Tono Geoscience Center (TGC) December 16. The main bulk of OHPs for that occasion is also appended for as paper for convenience: As asked for, the seminar focussed on "impressions from JNC and Japan" rather than to overview previous works. In the seminar I try to provide my "open and honest" view as one of the many inputs to JNC how to efficiently develop a safe solution for the nuclear waste generated in Japan.

3 OVERVIEW OF WORK

The work in JNC can be split in three main parts:

- Written technical reviews etc. concerning the JNC programme, in special the MIU- and Kamaishi projects and the preparation of the Second Progress report (H-12).
- Lectures, seminars at:
 - JNC (Tono, Tokyo, Tokai, Kamaishi)
 - CRIEPI (Abiko Lab)
 - Saitama University and Nagoya University (Nuclear Engineering, Volcanology/Seismology)
 - Atomic Energy Society Annual Meeting (Kinki University)
 - Äspö, Sweden
- Papers
 - 4 published - "Progress in Sweden - Opus 107", "Äspö experiences - Opus 74 ", "MIU-programme - Opus 105", "Experiences in Japan- Opus 110"
 - 4 in draft - "Stress around fracture - Opus 97", "Horizontal strain changes - Opus 100", "Excavation response - Opus 112", "Kamaishi results- Opus 114"

The reader is referred to the appended *readme.html* note and the List of Notes for more details. The Annual Report FY 1997 - Opus 68 - is also a convenient source of information.

4 IMPRESSIONS FROM JNC

This Final Report reflects on a few words from my Osaka lecture and later published in J Nucl Sci and Tech; "*In the work to promote the concept of geological repository there are some key words for the future:*

- *Facts and emotions*
- *Patience*
- *Flexibility*
- *Democratic process"*

The ongoing work of JNC (TGC) is now discussed within this framework.

4.1 Facts

Facts can be distinguished in *knowledge* "memorized information" and *skill* "ability to do something without thinking too much. *Know-how* is the combination of knowledge and skill and allows for "problem-solving within current practice". *Understanding* is

"problem-solving beyond current practice". Knowledge can be transferred. However it is not possible to transfer skill. An example: You can read ("knowledge") how to swim, but you have to teach yourself the skill to swim. Instructions give the pattern and with practice you can develop the "know-how" to swim. Know-how is needed for development of the geological repository but there is also need for understanding "problem-solving beyond current practice".

I now share a few impressions and also add some recommendations.

4.1.1 Knowledge

During my stay at Tono Geoscience Center (TGC) I have noticed good improvements in the TGC library. There is still much work to do to ensure that the library is complete and practical.

For the future I would like to have all reports, technical documents in a database. SKB for instance has system for free text search of all reports abstracts arriving to the library. I suppose JNC can acquire this database. If knowledge is easily retrieved, any members of JNC can use this information to plan the work. It is important that reports etc that arrives to TGC, really is indexed in the library.

An important part of knowledge is databases. I once again re-iterate that JNC should decide a general data policy to reflect the JNC slogan "open and honest". If not of direct commercial value, JNC databases should be made public. JNC must ensure that the database is transparent and traceable to prove that basic data are honest data. The database operation and database visualization needs skilled staff.

JNC participates in several international projects. My impression is that JNC sends a mailman to the meetings. However the mailman does not disseminate the information to the JNC persons doing similar projects. Thus JNC does not make full use of the participation in the international projects. The International Fellowships arranged for can to some extent compensate for this deficiency.

Last year I proposed JNC to arrange for a workshop where all International Fellows shared their views on the JNC work. A JNC letter asking for advice how to "cure the Japanese decease" preceded the proposal. I once again propose JNC to set up such a seminar with the JNC top management present.

I also have the impression that the Fellows in general are not given responsibilities and if they have responsibilities it is for "individual" rather than "group" projects. Personally I would not hesitate to take responsibility to run a JNC project which can be mutually educating.

4.1.2 Skill

Each task needs skill. Complex tasks necessitate long training to develop skill. The organization of JNC calls for that each task should be carried out within each section. Such an organization is a waste of company resources.

The skill already acquired within the JNC should be utilized as much as possible. An example: Suppose there is staff TGC very familiar with some complex software of use

for work in another section. My impression is now that the existing skill within the company is not used. JNC rather starts all over again, maybe with an in-house consultant and beginner using the software. He will never acquire the same skill and also leaves the company after a while with the skill he has acquired. As skill is lost, the know-how is also lost.

JNC should thus carefully scrutinize how investments in skill are made, how the investment is secured and developed. JNC should also carefully consider what type of world-class skill is needed and how it can be assured over long time. If JNC rotates tasks frequently, there will never be time to develop skill and thus the company know-how will be low.

JNC is responsible for the programme management, and I understand that there is administrative skill to make and control budgets. There is also considerable skill demonstrated in handling the local neighborhood - really a complex task. I would recommend higher awareness of general principles for technical project management, which can be acquired by education and practice.

I can not decide if the company is a skilled contracting organisation or not. I note that there are huge investments in software, hardware, equipment but less investments in education of the researchers. Training in management, and technical areas are dominated by "on-the-job-training". I think JNC should prepare individual yearly education programmes for each JNC member.

For the coming years JNC should increase competence in surface-based site characterisation and associated modelling. This calls for investments in e.g. staff for hydrogeology (field test planning, data interpretation, conceptual and numerical modelling).

On company level JNC should apply a formal Quality Assurance System for operation of facilities and conducting research and development work.

4.1.3 Know-how

As mentioned before, know-how is the combination of knowledge and skill for "problem-solving within current practice". JNC should undertake systematic benchmarking of important issues. To some extent this is carried through in cooperation with the "crystalline group" for performance assessment, the Äspö Hard Rock Laboratory Task force on numerical modelling and the OECD/NEA SEDE-group. The international review of the H-12 report is another opportunity.

JNC will need to decide necessary internal know-how in conjunction with the formation of an implementing body for geological disposal. Alternative use of the present know-how should be explored.

4.1.4 Understanding

Understanding is needed for "problem-solving beyond current practice". TGC work has really contributed to obtain a four-dimensional picture of Japan, i.e. how the geology of Japan has developed with time.

What is in the bargain now is to catch up with modern technology. New data sets will always create new findings. In the field of geoscience JNC needs access to expertise that actively follow the development in GPS and satellite technology.

JNC is wisely also using many external resources, from Japan and abroad. With respect to the Japanese universities it is useful to use old professors, but also young professors as science always is in a transient stage. I would prefer young professors for "do" and old professors for "review". Of course there are exceptional elder professors that really catch up with the development in the science and make huge contributions for JNC.

4.2 Emotions

JNC generates a lot of excellent information packages. I also think that TGC is handling local politicians and citizens very well. TGC understands how to run the operations smoothly. I am however not certain that the company is trusted due to earlier mismanagement of information at Monju and Tokai.

The sensitive information situation is unfortunately hampering the science work, delaying e.g. air-borne surveys and reflection seismic surveys. The practical planning of MIU is also focussed on study of "the deep geological environment" and all aspects to tie it with engineering and performance assessment issues as stated in the MIU-programme is suppressed. It is of overall importance that JNC can create the local understanding of the aims of the project - to develop technology for a safe geological repository.

Personally I think that JNC sooner or later will have to give good answer to the questions "Why a MIU laboratory?" "Why should JNC run the lab? " Why have the URL at Tono"? The public answer "to study the deep geological environment" is not sufficient for the decision-makers, as there is no need for a laboratory to exclusively study the deep geological environment.

In the daily work there are occasional campaigns for "safety", "cleanliness" etc. There should also be campaigns for methods to improve matters relating to openness. How to work so the stakeholders understand that JNC is improving? The slogan "open and honest" is also very useful for the internal work. Without open, internal discussions the rate of change will be slow. Encouragement, not reprisals, should be the response to ideas, criticism, opinions, urge for change.

4.3 Patience

The implementation of the geological repository is news to many citizens and there is need to show patience as change of attitude takes time. JNC also shows patience and endure all unexpected events with impressive stoicism.

In the JNC internal work however, there should not be much patience to expect anything else than outstanding results of its staff and contractors. Make milestones for groups, teams, and individuals. Daily excellent achievements are the road to overall success. Success also creates a stable environment for the company and stakeholders are more likely to overlook occasional failures with endurance. Development work is daily partial failure. However, stakeholders will not be patient if information are

withheld or tampered with. "Open and honest" is also a key word for stakeholder patience.

4.4 Flexibility

My impression is that the TGC organization is like a "bento-box". There are many small slots and they are kept separated. A "bento-box" style of organization is standard for e.g. a spy network operated by CIA or KGB with the idea is that the information in each box should NOT be passed to another section. Such an organization puts huge requirements to the (top) management to monitor and coordinate the daily progress in each individual box.

The "bento-box" organization is useful for display of the finished results, but not very useful to develop the contents of the bento. The analogy is that flour is in one box, water in another and salt in a third slot. The idea with development work should be to promote an organization that mixes the ingredients, which is the opposite of the "bento-box". It is crucial that information actively is disseminated and that each staff/manager/director take direct personal action to share relevant information irrespective of how the boxes are organized.

My impression is that the overall JNC paradigm is to separate "Plan", "Do" and "See". These parts are put in separate boxes. The Planning is focussed on cost and what will be done, not what products (deliverables) that will be produced. The "Do" is done in an annual sequence very much locked in by annual budget decisions. Contracted work can be suspended April-May to account for the time needed to make new contracts. I suppose the "See"-box is very much occupied by Budget See rather than Product See as the products are not explicitly defined in the Plan process.

I would rather favour a "Decide", "Do" and "See" process. The "Decider" contracts the work to the "Doer" (internal or external) and asks the "Viewer" to review the results periodically. JNC uses this principle for externally contracted work, but not for the internal work, to my opinion. The work should be monitored more closely and more frequently and based on the findings the "Decider" should decide necessary changes. Act flexibly in between each annual budget decision.

The rate of change (flexibility) can be increased by several measures and there is standard management literature available to offer advice like cutting down on the number of management layers.

I point out some of my experiences:

1. Set down "Success criteria" - i.e. what should occur to make a project a success
2. Make SWOT analysis (Strength, Weakness, Opportunities Threats)
3. Decide what must NOT fail.
4. Organize teams that are organized in accordance with the objectives. The team should be responsible to change how the work is carried out; the important thing is to meet the success criteria.
5. Always discuss "What is the right thing do? Improve, improve, and improve.
6. Share information as much as possible

Flexibility is also increased by change of contracting practice; small, shorter contracts could be more advantageous than a few yearly contracts.

The "bento-box" organization is not flexible. Information generated within one box (section) is not passed to other boxes (sections) which may be an enormous waste. The management should really take responsibility for the technical management of the programme also and ensure that relevant technical information systematically is shared within TGC and also between the Tono, Tokyo and Tokai branches. What is needed is to focus on the objectives and to make them clear and understandable. There is thus need for management to make systematic programme review and systematic programme adaptation in the light of achievements.

4.5 Democratic process

It is likely that many decisions relating to geological disposal will be made by political representatives or in direct local referenda.

All facts must be openly disclosed and explained. Emotions arising must be understood. Patience is needed to let the citizens learn all aspects of geological disposal. Flexibility is needed to adapt the implementation.

It is advantageous that the technical results have been published in international peer-reviewed journals. Most? JNC results are published in (waste management) conferences but this not sufficient. JNC should ensure that important findings are supported by the learned society. The performance assessment is of particular concern. It is not likely that a learned society can review such work. Creating an independent Japanese nuclear authority doing independent control of the performance assessment could be helpful to generate necessary public trust. Lack of public trust is a major obstacle for the smooth implementation of geological disposal.

Current worldwide works on performance assessment are not enough transparent and traceable, to my opinion. I foresee major improvements to be necessary. It is not enough to find that the repository is safe; it is also important to state if there are assumptions, scenarios, data, events, features, processes etc. for which the repository will NOT be safe.

JNC should be trusted as a scientific organisation and JNC should openly and honestly report all findings either they promote or discredit geological disposal.

5 IMPRESSIONS FROM JAPAN

In short: It has been a tremendous positive experience. The reader is referred to Opus 110 for some of the details.

I do hope it is possible to continue the exchange somehow, either by visits to Japan or by visits to Sweden from Japan.

My whereabouts in Sweden is kept by JNC. Please, visit Sweden!

Appendix to Final Report

Readme.html

WBS No: Author: Göran Bäckblom

Date: Dec 16, 1998 Opus: 113

Subject: Read me to cd rom for files

INTRODUCTION

During my stay as International Fellow March 12 1997 - December 22 1998 a pile of documents and files have been produced. This document is a *readme.html* file explaining the "deliverables".

The content of the cd-rom is described in some detail below. Parts of the content of the files are stored in paper files BACK Notes 1, 2 and 3. These files are available after contact with Kuma Sakuma, TGC

Most files are produced by Office 97 package (Word 97, Excel 97, Powerpoint 97), Adobe Illustrator 7 and ArcView 3.0 software

FILE HIERARCHY

During my stay I have produced 116 short written contributions, see the sub-folders to "My documents". All these documents called "Opus" are included in a Master folder. A List of Notes provides the index to these files.

As part of my task I have studied the horizontal strain changes in the Japanese bedrock using data from triangulation, trilateration and GPS measurements. All these files are included in the Strain folder. Plotting of results were done using ArcView, see the folder Data Files. The last section is miscellaneous.

MASTER FILES FOR OPUS

The Annual Report FY 1997 provides an overview of work March 1997 - March 1998. Since then the work has continued along the same lines. Of some interest are a recent compilation of excavation responses and how the response is accounted for in PA. The draft paper is enclosed as Opus 112.

The collection of OHPs may be of some interest, e.g. the three introductory lectures at

Nagoya University on Nuclear Engineering. The Final Report provides some general comments on the JNC programme.

My experience as foreigner in Japan can be of interest. Late 1998 STA will publish my small essay in their monthly magazine.

STRAIN FILES

Data on horizontal strain changes have been downloaded. Opus 58 provides a basic documentation of the data, data manipulation etc. In hindsight the file documentation should have been more stringent. GPS data are filed gps, 100 year's data hizumi100 and 10 year's data hizumi10. The Excel files manipulate the data to calculate necessary strain data for inter-comparison in ArcView. A paper has been drafted to study the influence of geological structures on the strain field

The analytical strain field around a flat elliptical fracture with zero friction was developed and a paper drafted.

Earthquake catalogues from NIED and JMA were acquired through Internet/cd and later compared. Some stress measurement data were also acquired. Strain data, stresses, active faults, earthquake catalogues have e.g. been image-dumped on an Adobe Illustrator 7 file.

DATA FILES

The Data folder contains the database etc to view stresses around an elliptical fracture, strain changes in 1,10 and 100 years perspective, location of active faults, volcanoes etc. The original data are converted to UTM coordinates. The file structure developed by ArcView is messy, but starting the project files lasthizumi.apr or stress.apr is the key to success. These files are stored at /data/japan/geogh/goran/. Set device name to k: for the cdrom-reader.

MISCELLANEOUS FILES

This folder contains typically not-important-material.

NOTES

by

Göran Bäckblom

List of contents

List of contents of written notes

Date: December 16, 1998

Note #	Date Issued/ Revised	Pages	Title
1	970321	11	Comments on "Guide-lines for research and development on geological disposal of high-level radioactive waste, Advisory committee on Nuclear Fuel Backend Policy, Atomic Energy Commission of Japan, November 1996
2	970402	9	Questionnaire for interview(s) with PNC staff
3	970331	14	Comments on the SKI Site-94 report SKI 96:36 Deep Repository Performance Assessment Project.
4	970402	1	Borehole location - some issues to address.
5	970407	5	Short notes on data management. Status, experience, recommendations
6	970409	3	Preliminary notes on shaft engineering
7	970414	9	Some general comments on the geological environment R&D with focus on the MIU.
8	970414	1	Short notes on hydrogeology
9	970424	13	Geological repository. Note on system feasibility
10	970424	1	Note on hydrogeology
11	970424	1	Comment on Report PNC ZJ 7586 96-003 (Summarizing borehole report)
12	970508	23	Similarities and differences for siting, characterizing, designing an Underground Research Laboratory and a geological repository
13	970416	2	Comments on application and development of (numerical) models for flow
14	970423	2	Proposal for supporting study "Retrievability of waste from a geological repository"
15	970529	8	Note etc, on the Kamaishi experiments. Trip report from visit May 27-28 1997
16	970616	18	Simplified construction analysis of the MIU-site based on AN-1 borehole data Technical Note.
17	970602	1	Hydraulic measurements at the Kamaishi EDZ-experiment - additional comment
18	970619 Rev Oct 13 1997	10	Status report March-June 1997
19	970617	29	Seminar (on siting) June 17, 1997

		OHP	
20	970616	11	Note on integration
21	970708	2	Letter to Katsurugawa
22	970709	2	Information disclosure
23	970714	8	How many boreholes are needed?
24	970728	2	Note on final reporting of Kamaishi work
25	970728	2	Kamaishi experiments. Trip report from visit July 23--July 25, 1997
26	970729	10 OHP	Design study for MIU. Meeting 29 July 1997
27	970804	1 + encl	Abstract to Waste Management'98 (postponed) jointly with ANDRA, UK NIREX, PNC and SKB "Underground research Laboratories in France, Japan, Sweden and the UK. Similarities and differences in the general approach, objectives and siting."
28	970804	1	Regional hydrogeological programme. Comments to hydraulic tests.
29	970804	1	Abstract to Waste Management'98 "The Mizunami Underground Research Laboratory. General approach, objectives and current status."
30	970811	5	PNC 2nd Progress Report - general recommendations based on presentations etc. Aug. 1 and Aug 6-8, 1997
31	970812	6	PNC 2nd Progress Report - Comments to Technical Memos etc.
32	970815	8	PNC 2nd Progress Report - Technical Memos. Comment Not #3
33	970815	10	Evaluation of the general plan for the Mizunami Underground Research Laboratory
34	970820	3	Approach to predictions in site characterisation
35	970821	2	"Active" faulting
36	970828	23	How (not) to present performance assessment results
37	970904	8	The H-12 Reference Cases and comments following meeting in Tokyo Sept. 1
38	970905	1	Evaluation of site characterization methodology (encl. Äspö paper)
39	970821	~12	Seminar on Underground Engineering. (text OHP)
40	970911	~10	Seminar, Saitama University (excerpts of OHP)
41	970916	3	Letter to Swedish communities from SKB Oct. 1992
42	971013	4	Status report July -September 1997
43	971013	5	Rock stress conference 97 in Kumamoto. Trip report from participation Oct 7 - Oct 10 1997
44	971030	12	THE MIZUNAMI UNDERGROUND RESEARCH LABORATORY - Condensed description of some technical facts (as extracted from a draft review of the programme)
45	971030	47	THE MIZUNAMI UNDERGROUND RESEARCH LABORATORY - A Critical Review of the Programme for the Surface-based Investigation Phase (PNC 7070 97-001)
46	971106 971125 R	4	Siting - definition of technical suitability. Opus 46

47	971114	13	THE MIZUNAMI UNDERGROUND RESEARCH LABORATORY IN JAPAN. GENERAL APPROACH, OBJECTIVES AND CURRENT STATUS. Draft Paper to Waste Management'98, including 3 figures, 3 tables
48	971118	4	Definition of siting and site characterisation factors of importance for containment. Opus 48
49	971118	5	Definition of siting and site characterisation factors of importance for technology. Opus 49
50	971119	4	Definition of siting and site characterisation factors of importance for the barrier retention function. Opus 50
51	971125	7	Compliance of siting factors and site characterisation factors
52	971125	5	Siting in the H-12 report. Background. Opus 52
53	971125	5	Siting in the H-12 report. Summary. Opus 53
54	971127	1	Kamaishi Work Shop 10 Nov
55	971127	1	Äspö Task Force Meeting 11 – 13 November 1997
56	971215	15	TRIP REPORT - visit to Abiko Lab Dec 11 (Siting in Sweden and role of URL) and PNC Head Office Dec (Siting in Japan)
57	980114	4	Status Report October - December 1997
58	980210 Revised 980305 980408	11	Preliminary documentation of studies to compare horizontal strain changes in Japan over time periods of 1 year, 10 year and 100 years
59	980130	9	Recommendations concerning engineering etc. Visit to Tokai works Jan 27 + Jan 29.
60	980204	5	Questions and answers concerning the Äspö Technical Summary Report SKB TR 97-03
61	980313		Stresses around a flat elliptic fracture with zero friction
62	980313	2	Meeting with professor Aoki, Association of Development of Earthquake Prediction, Tono Research Institute of Earthquake Science, Mizunami
63	980313	2	Shear failure along a fracture plane
64	980330	6	Presentation at the Atomic Energy Society March 27, 1998
65	980331	47	REQUEST FOR REVIEW Strain Changes in the Japanese Bedrock and their Correlation to Geological Structures
66	980331	1	Abstract to 3 rd Äspö International Seminar. Experiences gained from the Äspö Hard Rock Laboratory Site Characterization Strategy
67	980331	2	Status report January 1997 - March 1998
68	980406	29	Annual Report FY 1997
69	980410	1	Visit to Nagoya University April 9
70	980420	20	Review of H-12 "Executive Summary"
71	980417	7	Seminar April 17, Ongoing horizontal strain changes in the Japanese bedrock - do they matter?
72	98050x	16	Paper to Nuclear Science and Technology, "Progress Towards a Swedish Deep Repository for Spent Nuclear Fuel.
73	980427	17	Proposal for a new MIU Information Leaflet
74	980518	10+	Paper to 3 rd Äspö Int Seminar "Experience Gained from the Site

		OHP	Characterisation Strategy Used at the Äspö Hard Rock Laboratory"
75	980518	6	Seminar "Annual Report FY 1997" presented at May 18.
76	980520	2	Comments on siting description etc for the H-12 report
77	980522	4+ encl	Project Administration Development - Comments on PC draft proposal
78	980616	4+enc 1	Trip report Sweden June 8 - June 12.
79	980624	40	Review of "H-12-Executive Summary" - June Version.
80	980619	1+enc 1	Trip report Seminars on Geodynamics - Nagoya University June 18
81	980626	7	Note on H-12 report - mechanisms etc.
82	980706	4+enc 1	SHORT NOTES Discussion on Engineering Tokyo Head Office July 2
83	980706	1	SHORT NOTES Discussion with Professor Kato Tokyo July 3
84	980707	2	Status report April 1998 - June 1998
85	980707	5	NOTES from discussion on Borehole Investigations
86	980708	1	NOTES from discussion on Geological Mapping
87	980714	1+ encl	NIED Earthquake catalogue,
88	980714	1+enc 1	Letter to Professor Kato, Earthquake Research Institute
89	980721	1	Review (language) of paper by Iwatsuki, Yoshida to Geochemical J "Groundwater chemistry...Central Japan"
90	980722	3	Preliminary evaluation of the near-field rock descriptions in the H-12 report.
91	980723	2+enc 1	Review of paper on site characterization by Erik Webb
92	980724	2+enc 1	Review of paper by Matsui
93	980806	2	Proposals based on trip report to Kamioka and Kamiokande
94	980813	2+ encl	Note on the JMA and NIED Data Base
95	980817	1+ encl	OHP for the International Kamaishi Workshop Aug 24-25 1998 Study of damage and disturbance from tunnel excavation by blasting and tunnel boring. Results from the ZEDEX-project conducted at the Äspö Hard Rock Laboratory, Sweden.
96	980820	1+ encl	Comparison Numerical results using Fortran 77 (Double Precision) and Excel 97
97	980821	1+ encl	Letter to Int J Rock Mech & Mining Sci, professor Hudson, including paper.
98	980827	1	The International Kamaishi Workshop in perspective
99	980831	24	Mizunami Underground research Laboratory - Comparison of Engineering Practice in Japan and Sweden
100	980911	17+ encl	Draft paper to prof. Kato, Univ of Tokyo on horizontal strain changes
101	981002	3	Status report July -Sept 1998
102	981008	3	Clarifications to the PNC-Nagra workshop proceedings

103	981015	18	Review of H-12 Executive Summary - First draft
104	981016	1 + encl	Lecture 1 at Nagoya University in Nuclear Power and Nuclear Waste Management
105	981016	1+enc 1	3rd Äspö Int Conf. Mizunami Underground Research Laboratory in Japan
106	981026	1 + encl	Lecture 2 at Nagoya University in Nuclear Power and Nuclear Waste Management
107	981026	1 + encl	Printed paper J Nucl Sci and Tech.
108	981102	1 + encl	Lecture 3 at Nagoya University in Nuclear Power and Nuclear Waste Management
109	981102	1 + encl	Letter to professor Iguchi - experiences... lectures
110	981104	1 + encl	Contribution to the monthly magazine "STA - Science and Technology "My own experience in Japan."
111	981111	11	Do methodology used for the MIU-project resolve important site characterization issues?
112	981204	48	Overview of experiments to study effects of excavation on the rock close to the openings -draft to EDZ paper
113	981216	2	Final Note - readme.html for my JNC file archive on cd.
114	981207	22	Review of paper to Engineering Geology
115	981208	6	Final report - OHP for seminar Dec 16
116		9+ encl	Final Report - Opus 116

**Final Report
and
Bonenkai - recommendations**

Yens Geoscience Center
December 18, 1998
Göran Sjöckblom
JNC International Fellow

I will talk about...

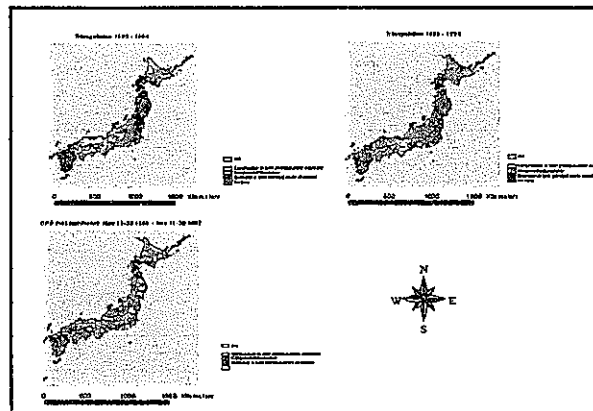
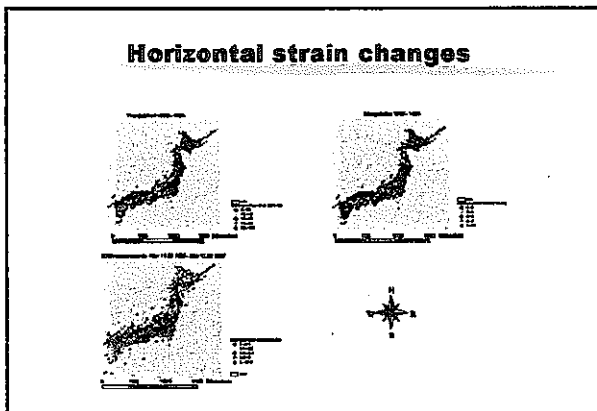
- Contributions March 1997 - December 1998
- Overview
- MIU, H-12, Kamaishi, Nagoya University etc
- Strain changes in the Japanese bedrock
- Excavation Response
- Impressions from JNC and Japan
- Acknowledgements

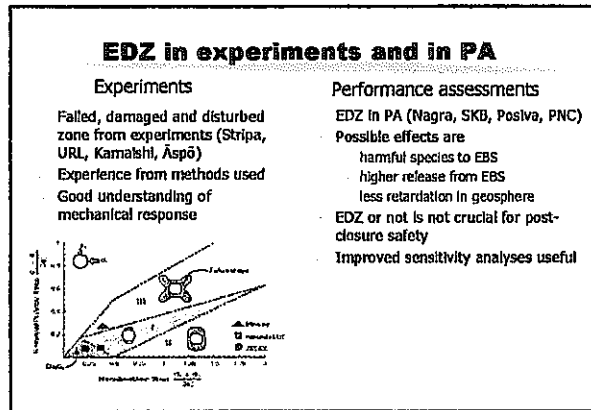
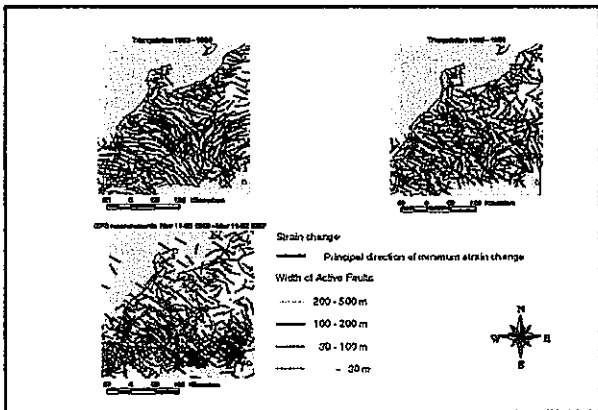
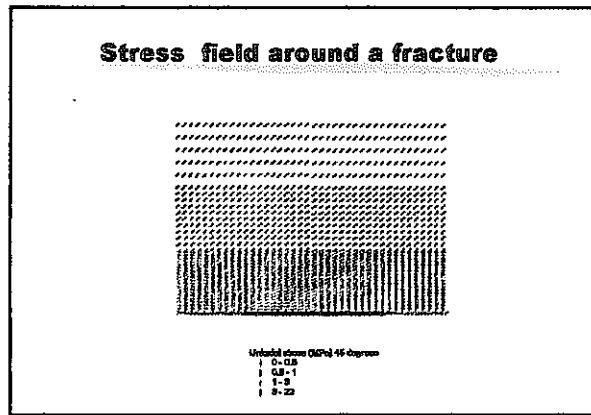
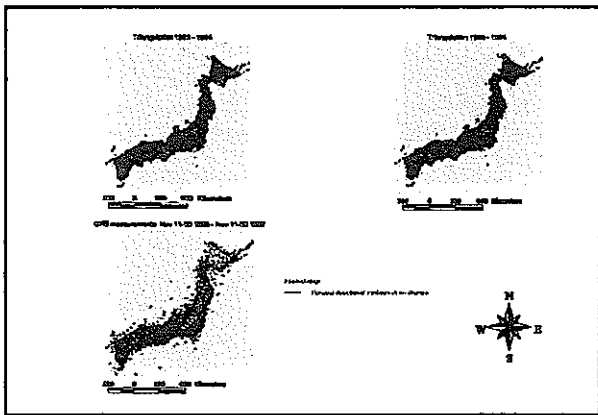
Overview of work

- Written technical reviews etc. concerning the JNC programme
- Lectures, seminars at
 - JNC (Tono, Tokyo, Tokai, Kamaishi)
 - CRIEPI (Abiko Lab)
 - Saitama University and Nagoya University (Nuclear Engineering, Volcanology/Seismology)
 - Atomic Energy Society Annual Meeting (Kinki University)
 - Åspö, Sweden
- Papers - 4 published - "Progress in Sweden", "Åspö experiences", "MIU-programme", "Experiences in Japan"
- Papers - 4 in draft - "Stress around fracture", "horizontal strain changes", "excavation response", "Kamaishi"

Technical reviews - examples

- MIU
 - better answers to basic question "Why a MIU?"
 - make a science programme not only a programme for the budget
 - simulate a repository
 - do modelling, not only data collection
 - develop the hydraulic testing programme
- Kamaishi
 - publish papers in peer reviewed journals (*post festum* remark)
- H-12
 - report all findings
 - make the report transparent, traceable





What will be needed to promote geological disposal?

Misconceptions are of no use

Keywords are:

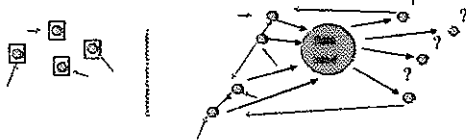
- Facts and emotions
- Patience
- Flexibility
- Democratic process

Facts are...

- Knowledge. i.e. "memorized information"
- Skill. i.e. "ability to do something without thinking too much".
- Know-how. Combination of knowledge and skill for "problem-solving within current practice"
- Understanding for "problem-solving beyond current practice"

Knowledge
"memorized information"

- TGC library has been improved but still much to do
 - All publications /reports, papers, / should be in central database
 - Free text search of titles, authors, abstract/summary
- Share information - do not store individually



Knowledge
The "memorized information"

- JNC should as soon as possible establish a database policy. Data should be made public when ever possible
- Develop centralised databases and local data visualisation capability
- Improve information-sharing from International projects where JNC participates
 - International Fellowship is a praiseworthy initiative
 - Do not send a "mail-man" to meetings who not share information - send the relevant technical person

Knowledge
"memorized information"

- Arrange an International Fellowship Seminar with JNC top management present, c.f. PNC Renovation Committee
 - Is the "Japanese disease cured"? Professor Yoshikawa:
 - "Nuclear cycle without front runners
 - Did not follow the changes of the outside world
 - Did not follow the rapid change of engineering of the outside world due to the closed nature of PNC"
- Use the International Fellows effectively
 - responsible for contributions work not in "isolated" projects but part of team or even leading a team

Skill
"ability to do without thinking too much"

- Skill can NOT be transferred. Must be acquired individually (Analogy: To learn to swim)
- It takes long time time to develop skill for complex tasks
- JNC waste skill by paying for skill development and then not use the skill developed. (Outsourcing, job rotation).
- "Bento-box" organisation of JNC sub-optimize skill within company as tasks are executed within the "section"

Skill
"ability to do without thinking too much"

- Keep track of need for (world-class) skill and maximise the use of skill acquired within the company
- Supplement "on-the-job-training" with technical, social, etc. education. Make individual yearly education plan
- Develop skill in project management and contracting practice
- Develop skill in site characterisation (In progress)
- Develop a formal Quality System for all activities

Know-how
"problem-solving within current practice"

- Know-how is the combination of knowledge AND skill. Do not waste know-how.
- Continue systematic benchmarking (the JNC participation in the PA crystalline group, Äspö HRL Task Force, H-12 provide partial answers)
- Develop know-how in modelling at Tono Geoscience Center
- Keep track of individual, branch and company know-how. Develop ideas how to use the know-how for other businesses than the waste business

**Understanding
"problem-solving beyond current practice"**

- Critical to know if problem-solving is "within" or "beyond" current practice
- JNC are in good contact with distinguished researchers
- Keep track of rapid changes in science.
- Increase number of Ph.Ds in the JNC organisation
- JNC contributes to understanding how Japanese bedrock develops with time - a four-dimensional story

**Geological Disposal
Expands the Frontiers**



- Facts and emotions
- Patience
- Flexibility
- Democratic process

Emotions

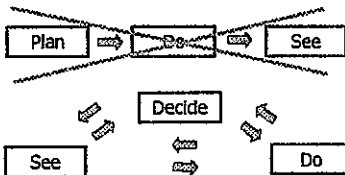
- JNC generates excellent information packages
- TGC is skilled to handle the local population. The uncertain situation unfortunately hampers scientific progress
- Educate everybody in TGC how to limit community outrage by courteous, open and honest behaviour
- JNC will eventually need a change of answer to the question "Why a MIU at Tono?"

Patience

- Tono GC shows patience with the local population
- JNC should NOT show patience internally, but eagerly expect and reward outstanding achievements. Make clear milestones for groups, teams and individuals
- Success history creates stakeholder patience which is necessary. Development work is supposed to fail now and then. However information management should not fail. "Open and honest" is a good JNC slogan.

Flexibility

- "Bento-box"-organisation not so suitable for development work as it hampers mixing of information, competence.
- Change sequential planning to iterative, flexible planning



Flexibility

- Use same principles for internal work as for external work

"Client-Contractor-Reviewer"

"Decide-Do-See"

Objectives-Scope of works-Organisation-Deliverables-Schedules-Costs

- Management devote much time to legal issues, social aspects, budget but less to the technical management - thus strengthen the technical peer review process

Increase flexibility by...

- Focus on what to achieve, not what to do. Decide "Success criteria"
- Analyse Strength, Weakness, Opportunities, Threats (SWOT)
- Decide what must NOT fail
- Organise teams in accordance with the objectives
- Always discuss "What is the right thing to do"
- Share Information as much as possible
- As few management levels as possible
- Change contracting practice from yearly large contracts to many smaller, shorter contracts

Geological Disposal Expands the Frontiers



- Facts and emotions
- Patience
- Flexibility
- Democratic process

Democratic process

- JNT must publish findings either they promote or discredit geological disposal
- Technical results be published in International peer-reviewed journals
- Independent nuclear authority probably needed to review the concept and the safety analysis
- Drastic improvements in PA transparency and traceability needed world-wide
- Consider facts, emotions, show patience and flexibility

Acknowledgements

This section is not complete and I sincerely apologize for not making it longer. However there is need to say a special *arigatou* to:
 Mr Sakuma for the invitation to come to Japan, for his mentor- and friendship,
 Dr Yusa and his family for being a good neighbour and supporter in my work,
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 Mr Uchida for good communications,
 Mr Aoki and his family for all enjoyable Kamaishi-experiences
 -and last but not least to all efficient secretaries and nice company drivers supporting the daily work by superb and elegant services.

I also experienced Japan...

- Hiking (Fuji, Ontake, Norikura)
- Climbing (Sawanobori Chuo alps)
- Fishing in creeks and Japanese sea
- Bicycling (Kisofukushima, Takayama, Akechi, Iwamurajyo, Tajimi)
- Concerts
- Sumo, Nagoya Basho
- Skiing (Kashimayari, Happo One, Yabuhara, Kisofukushimakogen, Norikurakogen, Kurumayama)
- Onsen
- Earthquakes, typhoons, rainy season
- Japanese food (including hornets) and drinks
- Bon-odori
- Halku, Hyakunin Isshu, Genji ga monotari
- Local citizens (Time, otsuya)
- Studying Japanese
- Playing Go
- Karaoke
- Sightseeing (Nagasaki, Kyoto, Nara, Tokyo, Hanamaki and Gifuken, Naganoken, Aichiken)
- Shopping
- Ryokan, minshuku, shinkansen

At last...

I leave a part of myself in Japan



Welcome to Sweden anytime!