NELSAM update

June 12, 2005

During the last few weeks we made progress in several central topics of our project. While we are late with respect to the original plan, we start seeing the light in the end of the tunnel. See below a list of the main points:

Characterization of the Pretorius fault is in progress: mapping of the fault-zone exposures in the accessible tunnels, logging of available core across the fault-zone (150 m long), sampling, geodetic survey of the fault-zone structure (in mine coordinates), and recognition of the fault segments that were reactivated during recent earthquakes (OU team).

Long boreholes drilling. The cubby for the long borehole drilling at 118 level is almost ready and we hope to start drilling by June 27 when the electrical connections in the cubby are expected to be completed. The drilling company of Boart-Longyear will drill four long boreholes (40-60m long) of 75 mm diameters; the holes are as follows (see attached map):

DAFAULT1 and DAFAULT2 are two 60 m long boreholes each to be drilled into both sides of the cubby, and they will be collinear with each other to facilitate commulative creap measurements. These hole are inclined at 20° (parallel to the host layers inclination), and they will extend beyond the maximum width of the Pretorius fault and its associated faults. Creep meters and thermister arrays will be installed here by USGS team.

DAFBIO will be drilled in an upward direction (25°) to length of 40 m. This hole will serve for microbiology monitoring and experimentation (Princeton & UFS teams).

DAFGAS will also be drilled in an upward direction (25°), next to the DAFBIO hole. It will be used for continuous monitoring of gas emission (GFZ and GSI).

We also plan to drill in the cubby area up to 8 short and small diameter holes (43 mm and up to 8 m long); these holes will be used for the acoustic emission array to be installed by GFZ and U of Tokyo teams.

Installation of accelerometers/EM/thermisters. These systems will be installed in nine boreholes that are 75 mm in diameter and 10 m to 30 m long, and one hole of 150 m length. The drilling for these systems in the 120 level is on its way: Site #10 was completed including the installation of the first accelerometer (dual 3-component system) (USGS); site #13 (30 m) will be finished by June 17, followed by drilling at sites #9 and #6. The team for drilling at the 118 level will start to operate in 2-3 weeks. In the future, the ISSI team will install the systems already built by USGS.

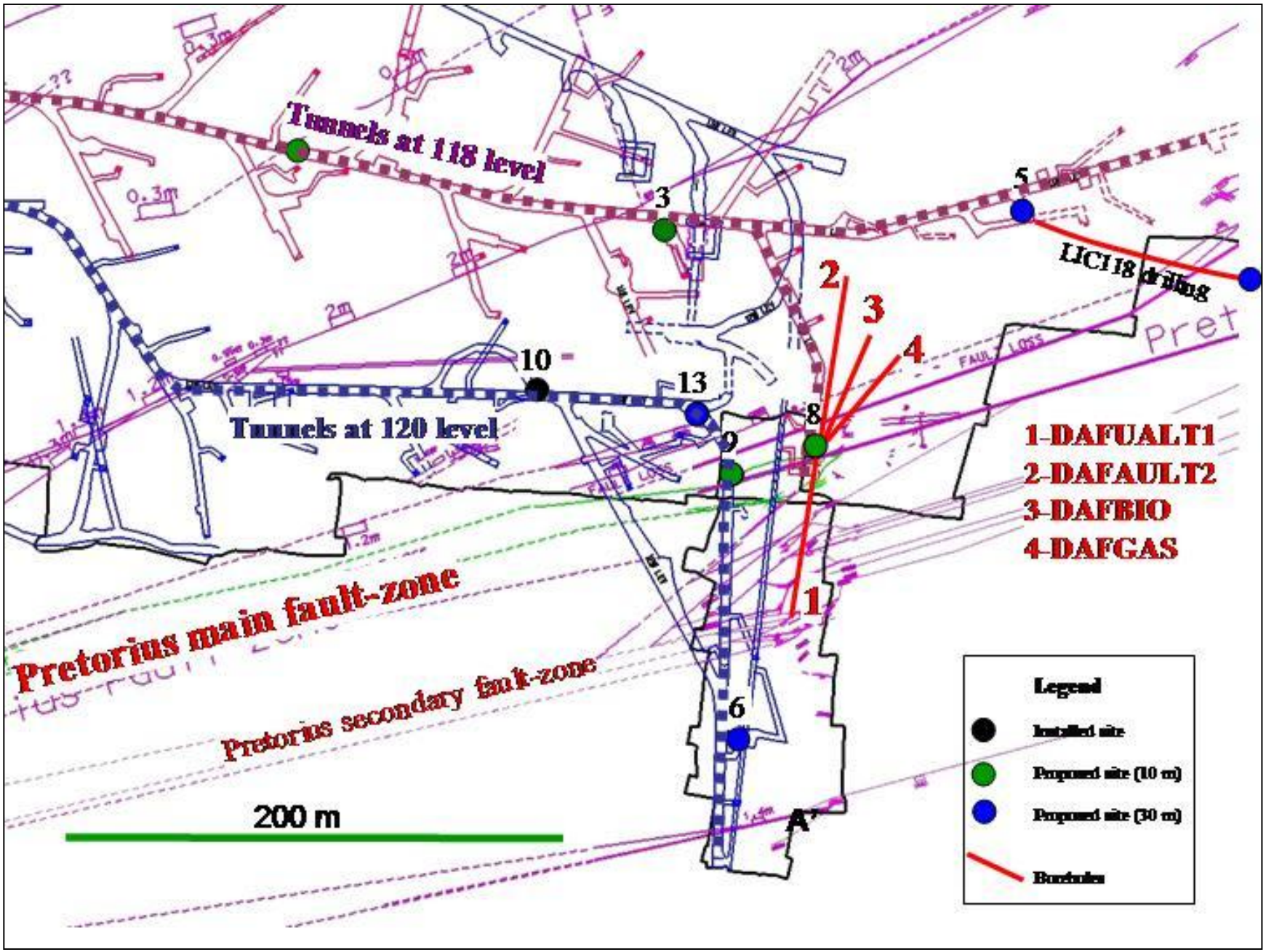
Borehole camera logging. The DOPTV system (product of Robertson Geologging) is operated by the OU/Stanford team that successfully logged the vertical hole #10 (down to 10 m depth), and the inclined hole #5 (down to depth of 45 m). Clear bedding, fault surfaces, and breakout zones, were identified in both holes, as well as drilling induced hydrofracture in hole #10. The main logging challenge will be on June 30: Logging 600 m in the borehole drilled by TauTona mine geology program at site #5.

People at work in TauTona mine for NELSAM:

South African investigators and support:
We could not achieve any accomplishments in NELSAM without the incredible and indispensable support of **Shawn Murphy, Pieter van Zyl, Rob McGill, George Kgori** (TauTona mine), and **Gerrie van Aswegen** (ISSI). Also, the work, advice, and suggestions of the professionals in the **Rock Engineering** and **Geology** departments of TauTona mine, and **ISSI** made great contributions.

Students:
Two PhD students of U of Oklahoma work now full time in TauTona mine: **Vincent Heesakkers** (Jan. 4 to July 6) and **Matthew Zechmeister** (June 4 to Aug. 13). **Kate Moore** (Honor student, U of Oklahoma) worked in TauTona mine during January on the initial stage of NELSAM. **Amie Lacier** (PhD student of Stanford) came for four weeks (March-April) to participate in the borehole camera logging and site survey. The two students of University of Western Cape, **Selwyn Adams** and **Curnell Campher**, return on June 12 for another month of work in TauTona mine to complete their Honor Thesis fieldwork. They previously worked in NELSAM during the month of January 2005, when they were joined by **Reggie Domoney**, their teacher of University of Western Cape.

Investigators:
Ze'ev Reches (U of Oklahoma) has been working in TauTona mine since Jan. 4 and he will continue until July 21 (with several breaks). **Tom Dewers** (U of Oklahoma)) worked in TauTona mine during January on the initial stage of NELSAM. **Malcolm Johnston** came for a week (May 15 to May 23). He was joined by **Peter Essick** of National Geographic who came for three days to photograph the accelerometer installations. The microbiology team of University of Free State, **Esta van Heerden, Derek Litthaur and Lizzele Piater**, came for to two planning visits for DAFBIO and the continue their great logistic support. On June 2, the NELSAM site was visited by **Georg Dresen, Jorg Erzinger, Onno Oncken** (GFZ), **Alex Milev** (CSIR) and **Masao Nakatani** (Tokyo University). The setting and design of the gas monitoring borehole and the acoustic emission array were discussed during this visit. **Yair Barak**, a photography teacher in the art school Camera Obskura , Tel Aviv, came to photograph the NELSAM operations (June 2 to June 7). **TC Onstott** (Princeton) intend to come in early August.


Tunnels at 118 level
Tunnels at 120 level
Pretorius main fault-zone
Pretorius secondary fault-zone
200 m
A'
1
2
3
4
5
6
8
9
10
13
LIC118 drilling
1-DAFUALT1
2-DAFAULT2
3-DAFBIO
4-DAFGAS
Legend
Installed site
Proposed site (10 m)
Proposed site (30 m)
Boreholes