

Report on the visit to the Mikheil Nodia Institute of Geophysics, Tbilisi, Georgie

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Pr. Avtandil Kordzadze and Pr. Demuri Demetrashvili welcomed us at our arrival at the Tbilisi international airport on the 20th of may at 4.00 am. After half a day dedicated to our installation in our hotel, get some rest and to a short visit to the town, we had first scientific meeting on the 21st of may at the institute.

1 Activities of the M. Nodia Institute marine and atmospheric modelling team

Avtandil and Demuri presented the scientific activities of their team (about ten members). Despite a lack of resources this team has developed a numerical model of the Black Sea and several applications:

- General Circulation Primitive Equation Model for the Black Sea: The numerical scheme is based upon a time splitting method [1]. Additionally a classical separation between barotropic and baroclinic components is done in parallel with a decomposition between the (x, z) and (y, z) plans [2]
- Three configurations are implemented in Fortran 77 (see Fig. 1) : a 10-5 km resolution configuration covering most of the Black Sea. A second smaller resolution (1km) covering the east of the basin (from 39°05' eastward) dedicated to studies of the Georgian coasts. Finally a Third configuration at high resolution ($\sim 100\text{m}$) for the coastal area of Georgia (the model seems different for this configuration).
- During World War 2 some highly polluting substances were dumped in the black sea. These pollutants are now resurfacing. The aforementioned Black Sea model is coupled to a pollution transport model that is used to solve an inverse problem in order to find the source of the resurfacing pollutants. Twin experiments are used to validate the system.
- They are doing researches about Ocean-Atmosphere coupling as well.

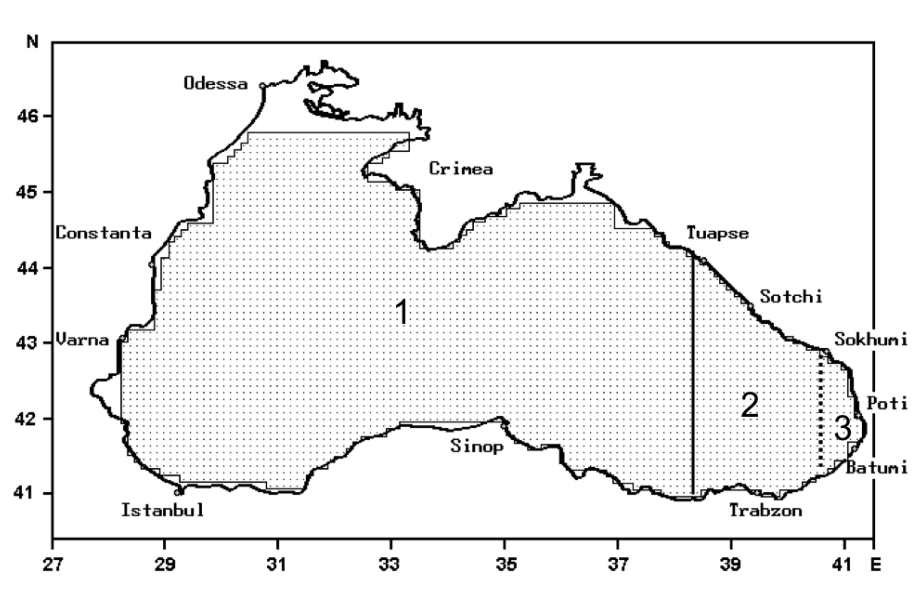


Figure 1: Nested configurations of the Black Sea

- This team is part of several international scientific projects gathering research teams from around the Black Sea and dedicated to its study.
- Avtandil is editor of the *Journal of the Georgian Geophysical Society*.

This team would like to be able to use the computing resources of INRIA in the framework of the ADAMS associated team when they will come to France, in order to test the full parallel potential of their numerical scheme. Currently they are doing their numerical experiments on a PC with a pentium 4 processor.

This simple presentation illustrated their scientific excellence and the quality and relevance of their researches.

2 Presentation of the Project-Team MOISE activity

A second working session was dedicated to the presentation of the activity of the MOISE project-Team by Arthur. Avtandil and Demuri were strongly interested by most of the topics, especially by the AGRIF nesting tool and our researches about model coupling and river hydraulics.

3 Presentation of the ADDISA project

A last working session was dedicated to the presentation of the ADDISA ANR project by Olivier. This was a good opportunity to describe more in details the variational data assimilation techniques with which they are not familiar, despite their knowledge of the adjoint methods. They were really interested and we committed ourselves to send them some bibliography on this topic.

4 Working environment

The working condition of our Georgian colleagues from the institute of geophysics cannot be compared with what researchers benefit from at INRIA. Their salaries are ridiculously low (about 150 euros per month for a high level professor like Avtandil while the living cost did not appear to be significantly lower than in Europe). The operating budget of the team is likely to be low:

- few computers available ;
- almost no access to international scientific publication.
- The ability to print document seems reduced.
- Apparently only one PhD student.

Even if Demuri could patiently translate most of our conversations, one should note that communication was made difficult by their relatively low level in English and our total ignorance of Georgian and Russian.

5 Conclusions

We were very well received by our hosts. Their kindness was almost embarrassing when you know the differences in wages, working conditions or simply life that separate us. Avtandil and Demuri have indeed invited us several time at the restaurant, at home, and we did visit the surrounding countryside twice with Avtandil's own car. Their scientific level (especially theoretical) is impressive (see CV of Avtandil) and like them we hope that this project will enable them fill the gap in terms of computing power and capacity coding. We were in Georgia at elections time and national holiday, so unfortunately we have met only three other members of their team. We believe that the results of this visit was very positive for both scientific and humane relationship points of view.

References

- [1] G.I. Marchuk, *Method of Numerical Mathematics*, Springer- Verlag, 316 pp, 1975

- [2] A. A. Kordzadze, D. I. Demetrashvili, and A. A. Surmava, Numerical Modeling of Geophysical Fields of the Black Sea under the Conditions of Alternation of Atmospheric Circulation Processes, *Izvestiya, Atmospheric and Oceanic Physics*, 2008, Vol. 44, No. 2, pp. 213-224 DOI: 10.1134/S0001433808020096
- [3] A. A. Kordzadze, A. A. Surmava, D. I. Demetrashvili, and V. G. Kukh-lashvili, Numerical Investigation of the Influence of the Caucasus Relief on the Distribution of Hydrometeorological Fields, *Izvestiya, Atmospheric and Oceanic Physics*, 2007, Vol. 43, No. 6, pp. 722-730.