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Anywhere Anytime Managing New Technologies in Geosciences (Ian McHarg Medal Lecture)

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The 20th century was characterized by “revolutionary” discoveries and tools in electronics and informatics and as a consequence also in geosciences.

A first revolution in the way to design new instruments and exploit data occurred in the seventies with the transistor (1954), the micro-processor (1970) and large computer like the IBM360 used from 1964 to 1978. The Personal Computer became a reality, and the Fax machine replaced telex and mail. The second important revolution in the way to access data, information as well as storage and computing power, is the Internet and the World Wide Web beginning in the 1990s. Unfortunately, this last revolution is still spreading in many countries; the digital divide compared to USA and Europe being still very significant, especially in many African countries. These technological advancements have significantly impacted the way the research has been carried out.

Until the second half of the 20th century, the different components of the Earth System- such as the atmosphere, the ocean, the solid Earth and so forth- were studied almost independently ones of each other. In the second half of the twentieth century, a better knowledge of the Earth components emerged - including their interactions and, their forcing and feedback mechanisms, as a consequence of the technological revolutions. A new concept was proposed based on a global approach of the Earth System with its multi-disciplinary aspects. Nowadays, our total knowledge about this complex system is contained in models and measurements; how we put them together has to be managed cleverly. The Coupled equations making up complex models have been developed to describe the Earth System and their resolutions have required supercomputers. The diversity of compute resource characteristics (Grid, Cloud, HPC) now available in Europe must permit to carry out more efficiently research; each application having the best fitted computers.

For the 21st. century Geo-scientists have a unique opportunity to carry out innovative work and open new fields as anywhere anytime they can or could at the same time access a large variety of datasets, storage and computing power as well as a wide range of software, tools and services to create and run their applications; a dream becoming reality. Now the challenge for the geo-scientific community is how to handle the explosion in the number and variety of promising technologies, subject to strong evolutionary change, for its research objectives. The situation is not yet ideal for geo-scientists, as the large diversity of technologies, new and existing, requires large investments of time and effort. They need to become acquainted with these technologies and evaluate them on the basis of their work, without knowing a priori if they will be serviceable and useful for their work or if other alternatives would have been the more effective or efficient choice.

So first, the presentation will be focused on some major critical points that geo-scientists encounter. Then several approaches to face these points will be presented based on experience in several projects. In order to have an efficient approach to evaluate all these new technologies, the experience on European Grid projects will be presented as it points out the importance of an e-collaboration network for sharing resources, trans-discipline knowledge, expertise and applications. Other projects will be also presented. Finally, as Ian McHarg did for ecology, geo-scientists can become pioneers in the use of these new technologies.