Geophysical Research Abstracts, Vol. 9, 10979, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-10979

Ecohydrology as a framework for integration of knowledge on terrestrial and aquatic systems.

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In the face of declining environment quality and deterioration of ecosystem services at global scale, the international scientific community has emphasized the urgent need for understanding of mechanisms increasing assimilation capacity of ecosystems to disturbances.

The Ecohydrology concept was one of the answers to that new demand. It underlined that ability of ecosystems to maintain homeostatic equilibrium results from integrity of their composing units at range of scales – from molecular to landscape level. As water is a medium for all ecological processes, thus it is water flow, which integrates these processes and structures across the scales.

During the Earth's evolution, water and temperature were key drivers for evolution of biota and development of complex soil-water-energy-biota interactions. On the other hand process of continuous adaptation led biota to become active and efficient regulator of energy flow and water circulation. Plant cover became important factor stabilizing the heat budget by reducing temperature extremes and wind speeds. It started to be also a major component defining characteristics of water cycle – water storage, evaporation rate, precipitation. This, in turn, created conditions favourable for further development of plants and higher rates of energy, nutrients and water conversion into biomass. Hence this 'green feedback' became and is recognized as a generator of self-sustaining and self-regulatory potential of nature.

Understanding of this exclusive pattern of building up ecosystem resilience has provided founds to the Ecohydrological principles. It also revealed the need for enhanced integration of knowledge, merging such disciplines as ecology, soil physics and/or hydrology.

The first, hydrological principle of Ecohydrology defines the framework for soil-biota-water interplay and indicates integrative role of water as a medium, stating that:

- perceiving of catchment and biota as integrated, self-regulating system covers such aspects as:

- Scale - the mesocycle of water circulation in a basin (terrestrial/aquatic ecosystem coupling) has been the template for quantification of ecological processes such as nutrient dynamics and energy flow;
- Dynamics - water and temperature have been a driving force for terrestrial and freshwater ecosystems;
- Hierarchy of factors - abiotic processes dominate (hydrology), however once they become stable and predictable the biotic interactions begin to manifest themselves (Zalewski & Naiman 1985).

The second, ecological principle expresses the proactive approach to the sustainable management of freshwater resources saying that:

- in the face of increasing global changes and unknown risk to nature it is not enough to protect ecosystems, it is necessary to increase their 'assimilation capacity' to human impact.

Finally the third principle "links" water cycles of aquatic and terrestrial systems, which have been for decades analysed separately by environmental sciences, and postulates:

- the use of ecosystem properties as management tools - as enhancement of ecosystem "assimilation capacity" can be achieved by "dual regulation" – biocenosis by hydrology, and vice versa, considering that many hydrology-biota interactions have indirect character - occurs through the soil and depends on its properties.