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The contribution of Web of Interactions framework to the whole system approach

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The concept of whole system approach offers a foundation for ecosystem studies. Identification of the components and interaction demonstrate the challenges in the field of ecology, due to the lack of a conceptual and applied framework. We attend to present a theoretical foundation and a methodology for identifying components and interactions of the whole system approach linking biodiversity and geodiversity processes into ecosystem diversity as a web of interactions (WoI).

The web of interactions model combines the geodiversity components that include climate, geology, geomorphology, and hydrology processes and their interactions and the biodiversity components that include population, community, ecosystem, and landscape levels of organization and their interactions. Linking biodiversity and geodiversity produces ecosystem diversity, which is represented as a web of diversity interactions that include climate, rock, soil, species, genetic, and functional diversities

In the talk we will present examples from our long term study in the Negev Highland, an arid water limited environment. The system is characterized by high geodiversity (topographic, geologic, geomorphic, and pedologic diversity) and high biodiversity with many unique and endemic species.

Our study presents the whole system approach of the Negev Highlands ecosystem as a web of interactions (WoI) among and between the diversity of components that links biotic and abiotic diversities. All the components and their interactions vary in time and space and together determine ecosystem diversity.

Long term study in the Negev Highland site revealed various of diversities of the ecosystem that can be linked by hydro-geo-ecological components, drivers, and feedbacks that control geodiversity and biodiversity. The main feedbacks are: the hydrological feedback that controlled by rainfall pattern and affects the pedological feedback by runoff generation that accumulates dust and regulates rock-to-soil ratio. These two feedbacks control soil moisture, which links geodiversity with biodiversity components. In addition, an energy and material feedback which is characterized by the producer-consumer and decomposer relationships supports ecosystem engineers that link geo and biodiversity. The functional interactions among the biodiversity and

geodiversity components create ecosystem diversity that is the driver of whole system properties.

We suggest that the web of interaction approach can potentially be applied to understand whole system emergent properties of terrestrial ecosystem.