P22 - LINKING WATER, CARBON AND NITROGEN CYCLES AT MULTIPLE SPATIAL SCALES

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How terrestrial ecosystems take up carbon dioxide (CO_2) from the atmosphere remains a fundamental challenge and needs to be understood to predict future changes in the Earth's climate. Carbon (C) and nitrogen (N) cycles are closely coupled since N is an important limiting resource for plant growth. Increased industrial activity, transport, and fertilization have and will increase N availability, and it is unclear how this affects C uptake in different ecosystem types and climate zones. We analysed site observations of carbon exchange from a global dataset to study this effect, and found that several ecosystem types will increase its photosynthesis with increased N deposition, but that this effect is not linear. Moreover, we found that stomatal conductance decreases at the leaf scale with an increase in CO_2, leading to a higher water use efficiency at canopy scale . Modelling the coupled carbon, nitrogen and water cycle is essential to further understand and predict future C uptake of terrestrial ecosystems and N delivery to ground- and surface water. For this, we will use the global vegetation model LPJ-GUESS, coupled to the global hydrological model PCR-GlobWB. Parameterizing such a model is, however, challenging. Extensive measurements of the C cycle have been set up worldwide, but global data on the N cycle are lacking. Currently, we are exploring the use of remote sensing canopy N to bridge this gap.

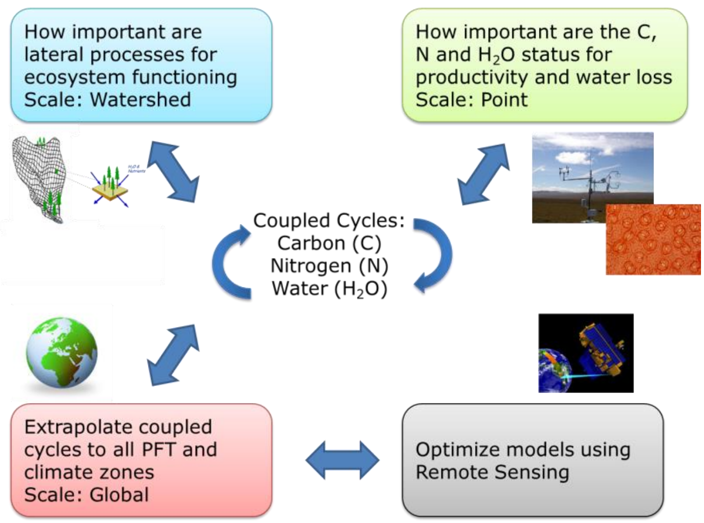

Figure 6 – overview of approach to couple C, N and H_2O cycles at multiple spatial scales.