Water transport and water content of trunk in different species of trees

IV/2

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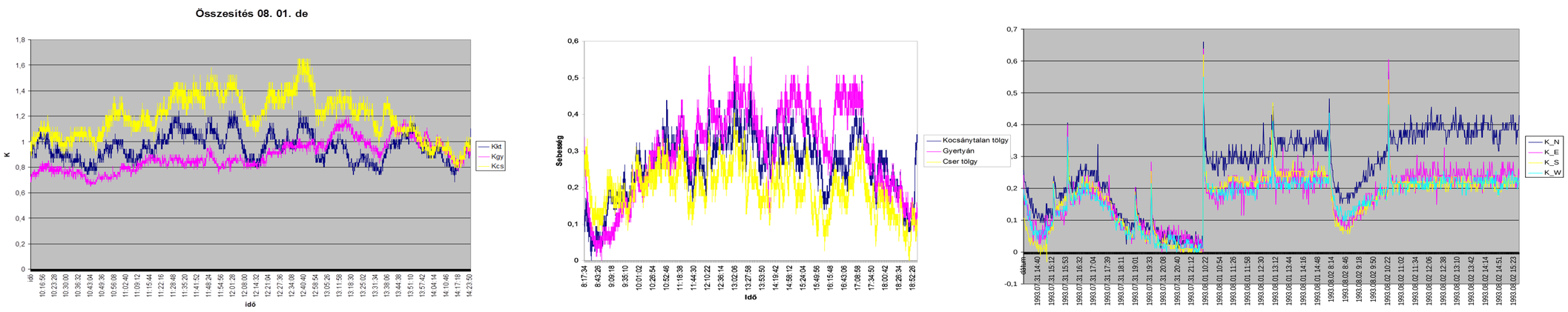
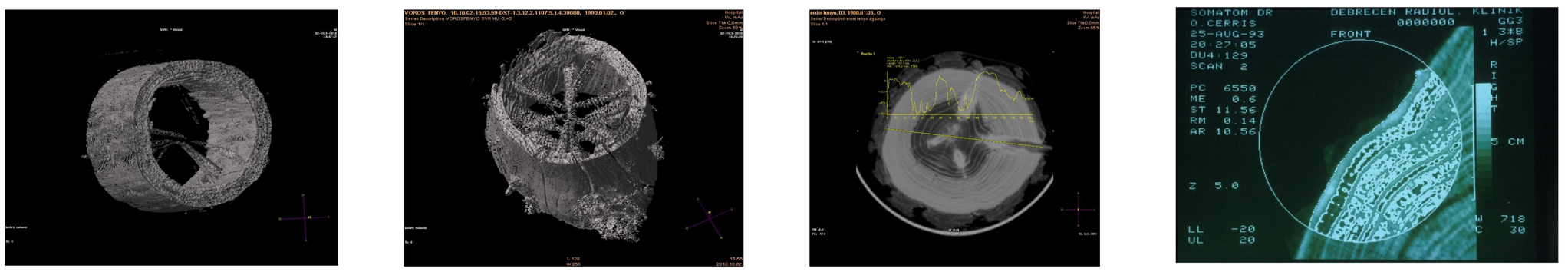
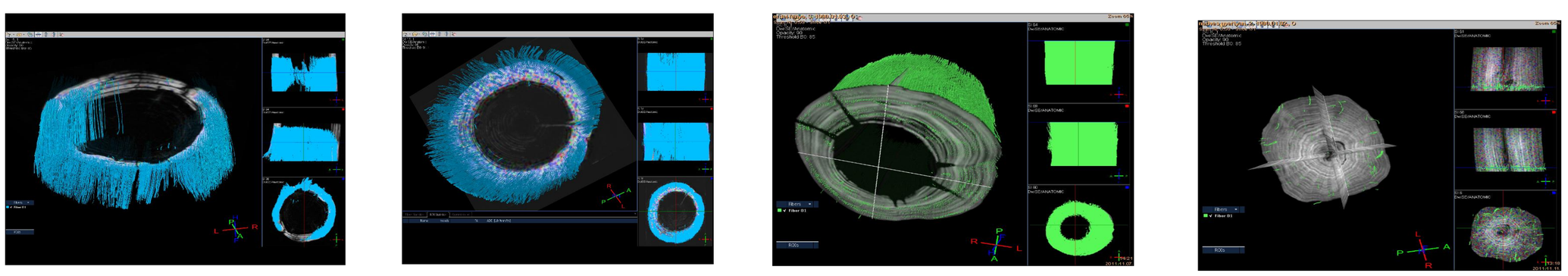
Our working group have been engaged in investigation of sap flow in trees for many years. Sap flow measurements can be divided into direct (isotope tracing) and indirect (heat balance, heat pulse) methods. As isotope tracing is very expensive, so in the present work the results measured by indirect methods are demonstrated. It was concentrated primarily to the water take up of trees after dryness because a fast water take up may be resulted an ecological advantage for a tree. The following species of trees were involved in this investigation: oaks (*Quercus petraea*, *Quercus cerris*), beech (*Fagus sylvatica*), hornbeam (*Carpinus betulus*), for some years pines (*Pinus sylvestris, Picea abies, Larix decidua*) were also considered. The amount of water storage in trunk proved to be characteristic for species and by means of that some species may be able to survive dry periods. The velocity of water take up after rain and the amount of storage water are different in different species. CT and MRI pictures show the distribution of free and structural water in trunks of different species. The decreasing level of precipitation and the lack of water in Hungarian forests in consequence of global warming can make preferable the plantation of those species which are better accommodated to dryness.



In the pictures are depicted sap flow results measured by heat balance technique. Sap flow curves was seen in the first picture before and the second picture after watering in oaks and hornbeam, and in the third picture in beech. After watering the different sides of beech tree show different water transport velocities. When a hornbeam tree and two oaks trees were compared, it seemed to be evident, that the hornbeam tree presented most impressive reaction to watering.



To prepare the trunks for high resolution computer tomograph it was necessary to apply an airproof isolation in order to preserve the original water content and distribution. The first and second pictures show the water content in the pines trunk, the third and fourth picture demonstrates how can be measured the water content area in the trunks.



Some magnetic resonance picture about water transport tracheas in pines and in hornbeam. Autumn there is a big difference between pines and deciduous trees.

Summary: The different species of trees have characteristic distribution of water reservoirs. The water pool in trunks is very important in surviving arid periods. After watering the saturation of reserve water pools occurs most quickly in Fagus and Carpinus trees. Our complex investigation methods proved to be useful and reliable for the future researches.

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