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Use of the computational-informational web-GIS system for the development of climatology students' skills in modeling and understanding climate change

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The current situation with the training of specialists in environmental sciences is complicated by the fact that the very scientific field is experiencing a period of rapid development. Global change has caused the development of measurement techniques and modeling of environmental characteristics, accompanied by the expansion of the conceptual and mathematical apparatus. Understanding and forecasting processes in the Earth system requires extensive use of mathematical modeling and advanced computing technologies. As a rule, available training programs in the environmental sciences disciplines do not have time to adapt to such rapid changes in the domain content.
As a result, graduates of faculties do not understand processes and mechanisms of the global change, have only superficial knowledge of mathematical modeling of processes in the environment. They do not have the required skills in numerical modeling, data processing and analysis of observations and computation outputs and are not prepared to work with the meteorological data.
For adequate training of future specialists in environmental sciences we propose the following approach, which reflects the new "research" paradigm in education. We believe that the training of such specialists should be done not in an artificial learning environment, but based on actual operating information-computational systems used in environment studies, in the so-called virtual research environment via development of virtual research and learning laboratories.
In the report the results of the use of computational-informational web-GIS system "Climate" (http://climate.scert.ru/) as a prototype of such laboratory are discussed. The approach is realized at Tomsk State University to prepare bachelors in meteorology. Student survey shows that their knowledge has become deeper and more systemic after undergoing training in virtual learning laboratory. The scientific team plans to assist any educators to utilize the system in earth science education.
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