Geophysical Research Abstracts
Vol. 15, EGU2013-11353, 2013
EGU General Assembly 2013

Wildfire effects on biological properties of soils in forest-steppe ecosystems of Russia

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Forest fires are regularly repeating natural phenomenon that disturb natural balance between separate components of ecosystems and influence on the type of vegetation and dynamics of plant communities. The soil, as a basic component of forest ecosystems, is affected by different impacts of wildfires.
Independently of a type and intensity of a fire the plant cover and a upper soil horizon always burn. There is also a transformation of the top organo-mineral and mineral horizons of soils when it's strong influence of fire and full combustion of a laying.
Complicated fire conditions in summer of 2010 were caused by extreme climatic effects and low precipitations. The area of soils affected by wildfires assessed as more than 744 000 ha. Forest fires have occupied Moscow, Yekaterinburg, Kaluga, Pskov, Samara and many other regions. The critical situation in the Samarskaya region around Togliatti city results in huge soil dergradation in forest-steppe pine forests.
The analytical data obtained shows that wildfires lead to serious changes in a soil profile. The most intensive were the processes of humus losses that result from burning of a forest floor and sod (humic) horizon. Wildfires change a chemical composition of laying and raise their ash-content. Fires lead to increase of biogenic elements' content in the upper horizon – P and K. The content of phosphorus and potassium in 2011 decreased as a result of carrying out with an atmospheric precipitation. Thus, when it is burning the top horizons the ashes arriving on a surface of the soil enrich it with nutrients. Moreover, there is an increase of the calcium content. Calcium provides alkaline reaction of the top horizons. But the next year the content of calcium in upper soil horizons decreased.
The soil unaffected by fire is characterized by the greatest content of soil microbial biomass in the top horizon and, respectively, the bigger index of bazal respiration whereas a reduction of both parameters is noted on postfire soils. Thus, as a result of fires there is a depression of microbial community.
The absence of forest floor and plant cover leads to intensification of surface erosion process, and destroying of organic matter leads to illuviation of low molecular organic fraction in middle part of profile.