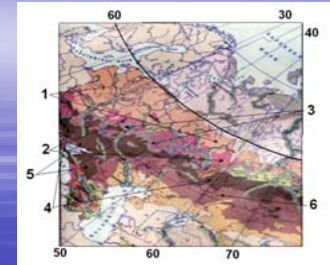


# Soil Moisture Changes in the Russian Federation: In Situ Data

Speranskaya N.A.

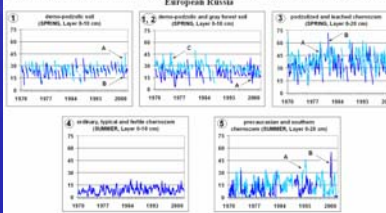
State Hydrological Institute, St. Petersburg, Russia

## Soil Moisture changes in European Russia

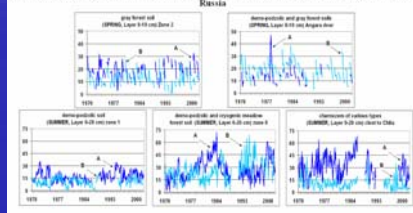


zone 1: A - north of the zone (to west part), B - north of the zone (to east part), C - south of the zone;  
 zone 2: A - whole territory;  
 zone 3: A - west part of the zone, B - east part of the zone;  
 zone 4: whole territory;  
 zone 5: A - west part of the zone, B - east part of the zone;  
 zone 6: whole territory

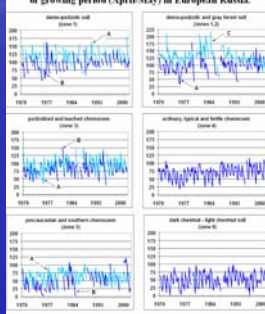
Soil Moisture changes within the upper 0-10 and 0-20 cm layers during the growing period in European Russia



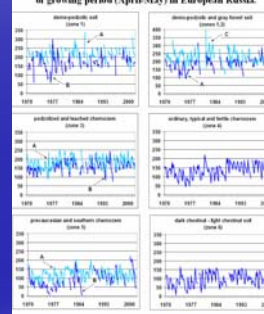
Soil Moisture changes within the upper 0-10 and 0-20 cm layers during the growing period in Asian Russia



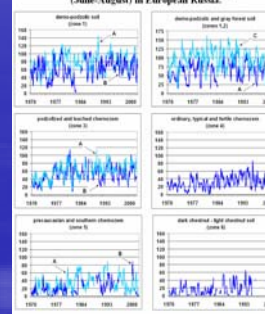
Soil moisture changes in the layer 0-50 cm at the beginning of growing period (April-May) in European Russia.



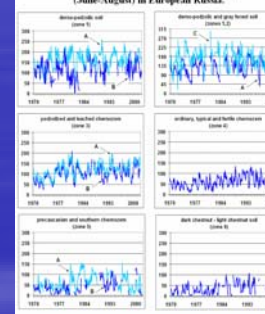
Soil moisture changes in the layer 0-100 cm at the beginning of growing period (April-May) in European Russia.



Soil moisture changes in the layer 0-50 cm during summer (June-August) in European Russia.



Soil moisture changes in the layer 0-100 cm during summer (June-August) in European Russia.



Soil moisture changes during the warm season in the Russian Federation are studied on the basis of 14 in situ observations from 00 stations in European Russia and 14 stations in Asian part with similar vegetation and water regime conditions (Speranskaya, 2005, 2006). To establish factors of soil moisture seasonal variations, data on the monthly precipitation and monthly soil moisture content that can be explained by vegetation cover and evapotranspiration were used for the analysis.

One European Russia soil moisture type of soil was selected: 1) semi-desertic soil (zone 1); 2) grey forest and forest transitional forest; 3) podsolonchik soil (zone 2); 4) chernozem soil (zone 3); 5) forest-steppe soil (zone 4); 6) steppe soil (zone 5); 7) forest-steppe soil (zone 6); 8) steppe soil (zone 7); 9) forest-steppe soil (zone 8); 10) steppe soil (zone 9); 11) forest-steppe soil (zone 10); 12) steppe soil (zone 11); 13) forest-steppe soil (zone 12); 14) steppe soil (zone 13).

In Asian Russia, soil moisture changes are studied on the basis of 14 in situ observations from 00 stations in Asian Russia and 14 stations in European Russia with similar vegetation and water regime conditions (Speranskaya, 2005, 2006). To establish factors of soil moisture seasonal variations, data on the monthly precipitation and monthly soil moisture content that can be explained by vegetation cover and evapotranspiration were used for the analysis.

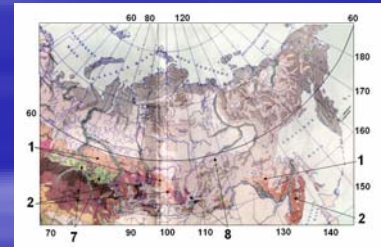
One Asian Russia soil moisture type of soil was selected: 1) semi-desertic soil (zone 1); 2) grey forest and forest transitional forest; 3) podsolonchik soil (zone 2); 4) chernozem soil (zone 3); 5) forest-steppe soil (zone 4); 6) steppe soil (zone 5); 7) forest-steppe soil (zone 6); 8) steppe soil (zone 7); 9) forest-steppe soil (zone 8); 10) steppe soil (zone 9); 11) forest-steppe soil (zone 10); 12) steppe soil (zone 11); 13) forest-steppe soil (zone 12); 14) steppe soil (zone 13).

The first attempt to analyze soil moisture changes over European and Asian Russia during 1970-2000 (2003) allows making the following conclusions:

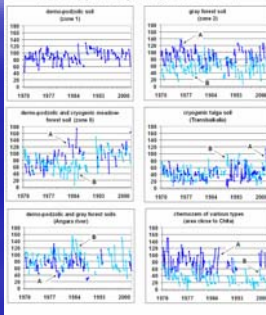
- Soil moisture changes within the upper 0-10 and 0-20 cm have very small seasonal component over the whole European territory of Russia. Soil moisture distribution here is closely related to the current precipitation and air temperature. Only from the layer 0-50 cm, some features of long-term changes in soil moisture regime are noticed for each type of soil. This is why soil moisture of the upper 20 cm layer cannot be considered as characteristic of a surrounding region of the entire soil layer.
- In Asian Russia soil moisture changes within the upper 0-10 and 0-20 cm have very small seasonal component like European part within the study season, although region with irregular soil when seasonal soil moisture changes are observed even from the depths of 20 cm. This soil moisture changes within the upper 20 cm may be used as indicator of moisture regime only European with irregular soil.
- Over the whole territory of Russia soil moisture variations at different layers 0-10, 0-20, 0-50 and 0-100 cm both in spring and during summer (the whole growing period). Only in the south of the zone of forest and forest transitional forest area of soil moisture increase is observed during the whole growing period.
- In Asian Russia, seasonal soil moisture changes are of more complex character than in European Russia. There are regions where soil moisture increases are noted during the whole growing period, while in other regions soil moisture decreases are noted during the whole growing period. In some areas soil moisture changes in spring and in summer are of different character.
- Over the whole territory of the Russian Federation, seasonal changes in soil moisture for upper 0-100 cm are more diverse if compared to those in the layer 0-50 cm.

## Soil Moisture changes in Asian Russia

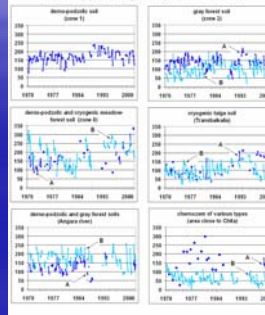
Zone 1: A - west part of the zone, B - east part of the zone;  
 Zone 2: A - north part of the zone, B - south part of the zone;  
 Transbaikalia: A - west part of the zone, B - east part of the zone;  
 Region within the upper course of the Amur a river: A - west part of the zone, B - east part of the zone;  
 Region located close to China: A - north part of the zone, B - south part of the zone.



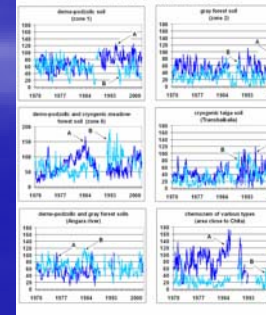
Soil moisture changes in the layer 0-50 cm at the beginning of growing period (April-May) in Asian Russia.



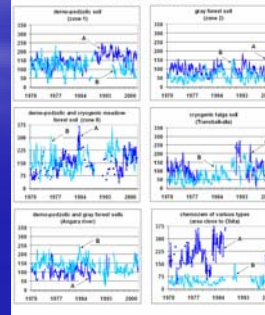
Soil moisture changes in the layer 0-100 cm at the beginning of growing period (April-May) in Asian Russia.



Soil moisture changes in the layer 0-50 cm during the summer (June-August) in Asian Russia.



Soil moisture changes in the layer 0-100 cm during the summer (June-August) in Asian Russia.



Parameters of lower trends (max 30 years) of soil moisture for layers 0-10 and 0-100 cm in European Russia for spring (April-May) and summer (June-August).

Region	Layer 0-10 cm		Layer 0-100 cm	
	spring	summer	spring	summer
Zone 1: Desiccation soil (zone of natural forest)				
West part (A)	1.3	32	3.4	64
East part (B)				
Zone 2: Grey forest soil (transitional part of the zone of forest transitional forest)				
West part (A)	-1	5	2.3	1.0
East part (B)				
Zone 3: Chernozem soil (zone of forest-steppe soil)				
West part (A)	-2.2	1.3	-3.6	2.4
East part (B)				
Zone 4: Forest-steppe soil (zone of forest-steppe soil)				
West part (A)	3.9	2.2	1.9	0.4
East part (B)				
Zone 5: Podsolonchik soil (zone of forest-steppe soil)				
West part (A)	0.3	2.1	2.7	5.6
East part (B)				
Zone 6: Forest-steppe soil (zone of forest-steppe soil)				
West part (A)	1.5	2.0	3.5	4.4
East part (B)				
Zone 7: Forest-steppe soil (zone of forest-steppe soil)				
West part (A)	1.3	2.0	3.1	3.7
East part (B)				
Zone 8: Dark chernozem (light chernozem soil zone of dry steppe)				
West part (A)	1.4	2.0	3.1	4.4
East part (B)				

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Note: All statistical lower trends parameters are calculated against the trend of 0% but none of them are close to zero.