Russian fires and Chernobyl fallout

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Fires in the Chernobyl area are capable of redistributing radioactive fallout particles over significant distances according to computer modeling. I employ the NOAA HYSPLIT model of the US Air Research Laboratory (1,2) to examine trajectories for particles originating at Chernobyl, Ukraine 51.26720N 30.19618E. This is an enormously powerful computer system which is freely available to anyone to use. It directly calculates the directions of airflows on the planet for any period, using a massive database of historical weather pattern information. Results show that the airflow patterns for the first two weeks of August include periods when the trajectories could have taken radioactive particles to the major capitals of the Baltic States and also to Helsinki. Other dispersion models show that same picture. There are also periods when the airflows could have taken the material south to Turkey. For example, the plot shown in Fig 1A and 1B below begins with releases at 12 hr intervals beginning at 0.00 on 7th August and forward projected for 240 hours (10 days). The NOAA HYSPLIT model program result predicts that material from Chernobyl could have arrived in Vilnius, Riga, Tallinn and Helsinki within a week. The computer generated data shown in Fig 2 gives the trajectory intervals of 12 hrs from initial release which shows the airflow patterns surprisingly would have taken the radioactive material right through the cities named.

Fig 1A Google earth trajectories computed using the NOAA HYSPLIT program from 0.000UTC on 7th August beginning at Chernobyl and continuing for 10 days

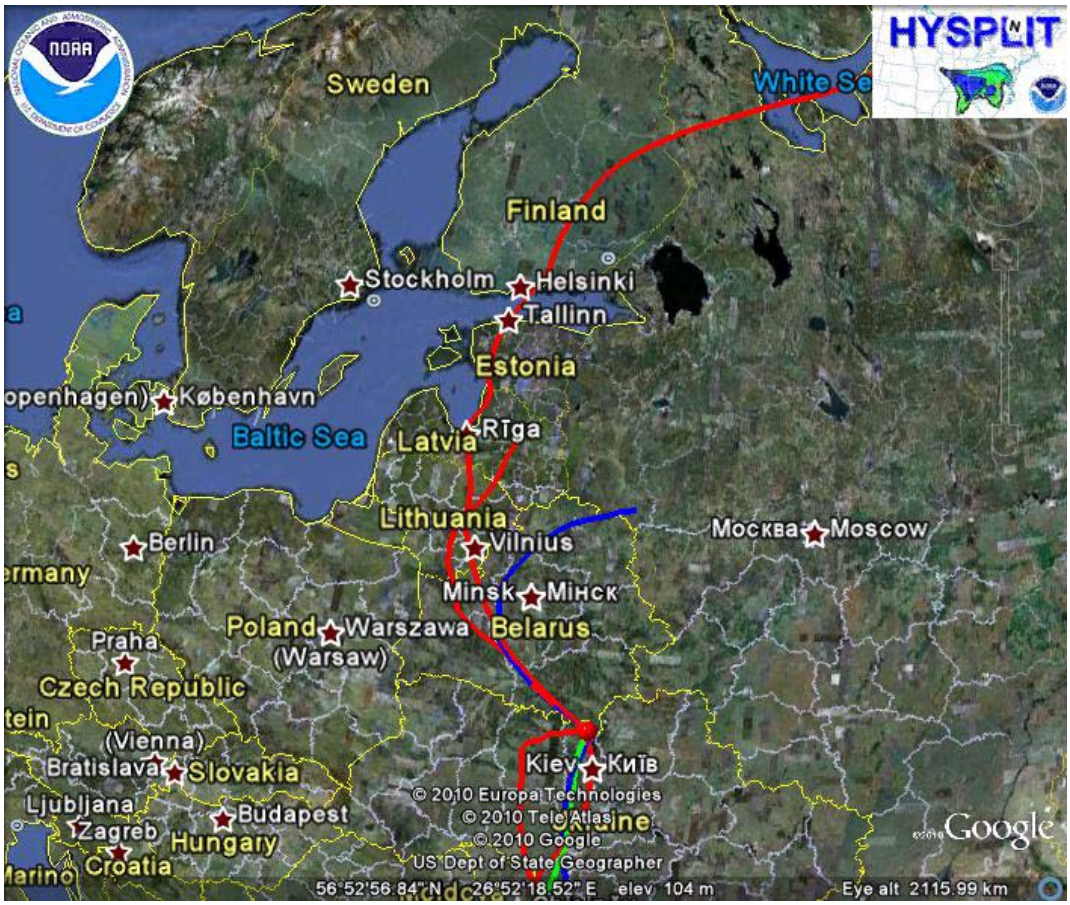


Fig 1B As for Fig 1 A but with perspective

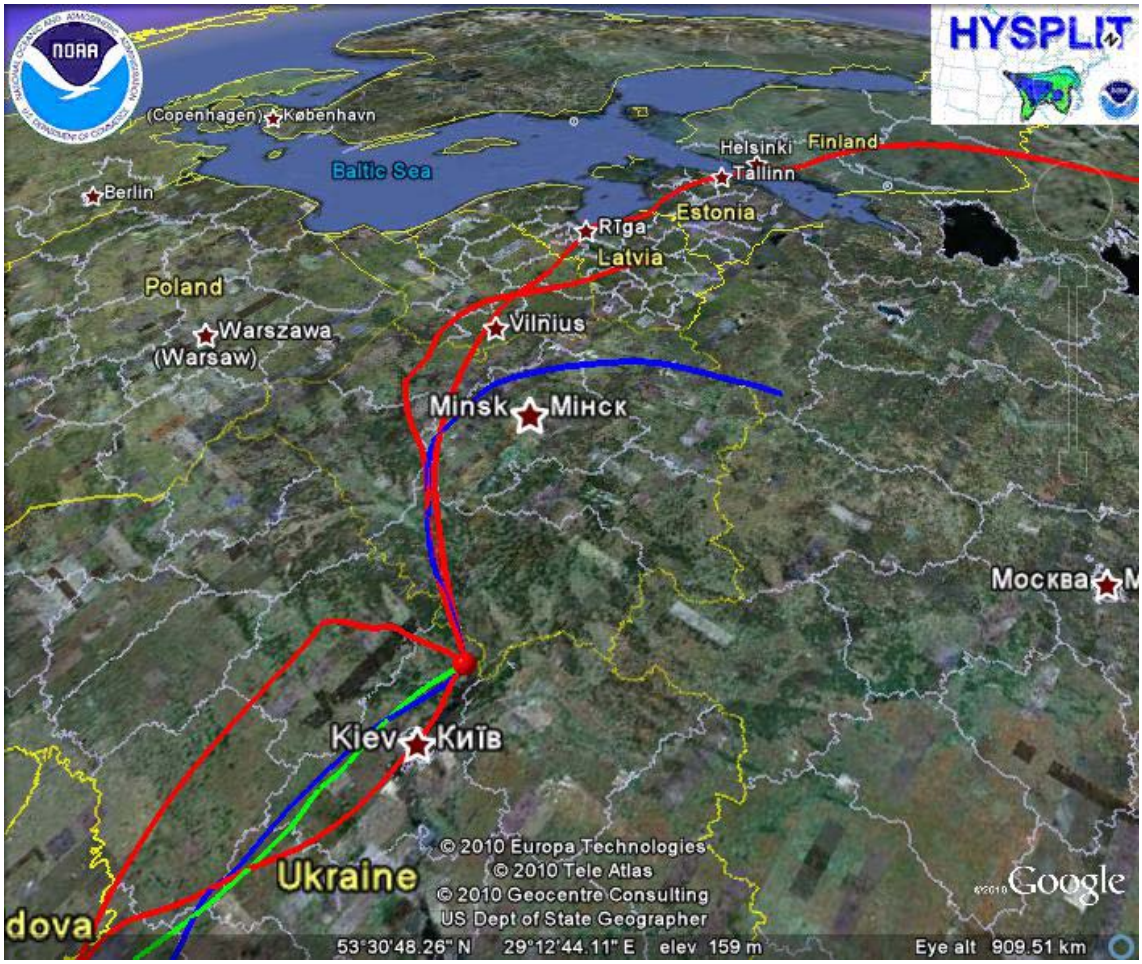
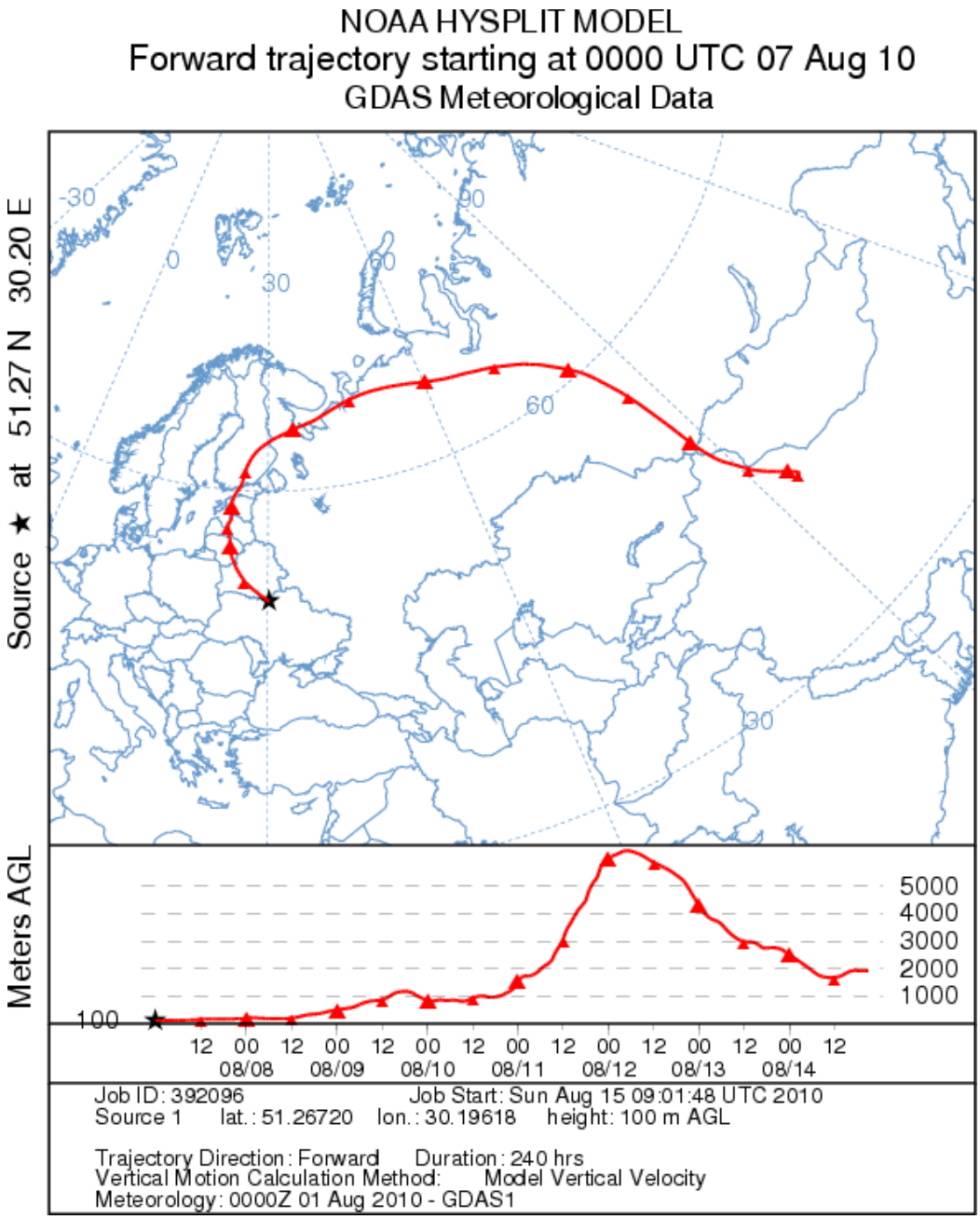


Fig 2. Details of the model calculation and (triangles) days after release.



48 hr dispersion calculations for the same period show that material would have moved across territory of the Baltic states as shown by Fig 3 below.

Fig 3 NOAA HYSPLIT radioactivity dispersion calculation for 48 hr after release from Chernobyl of unit radioactive airborne material.

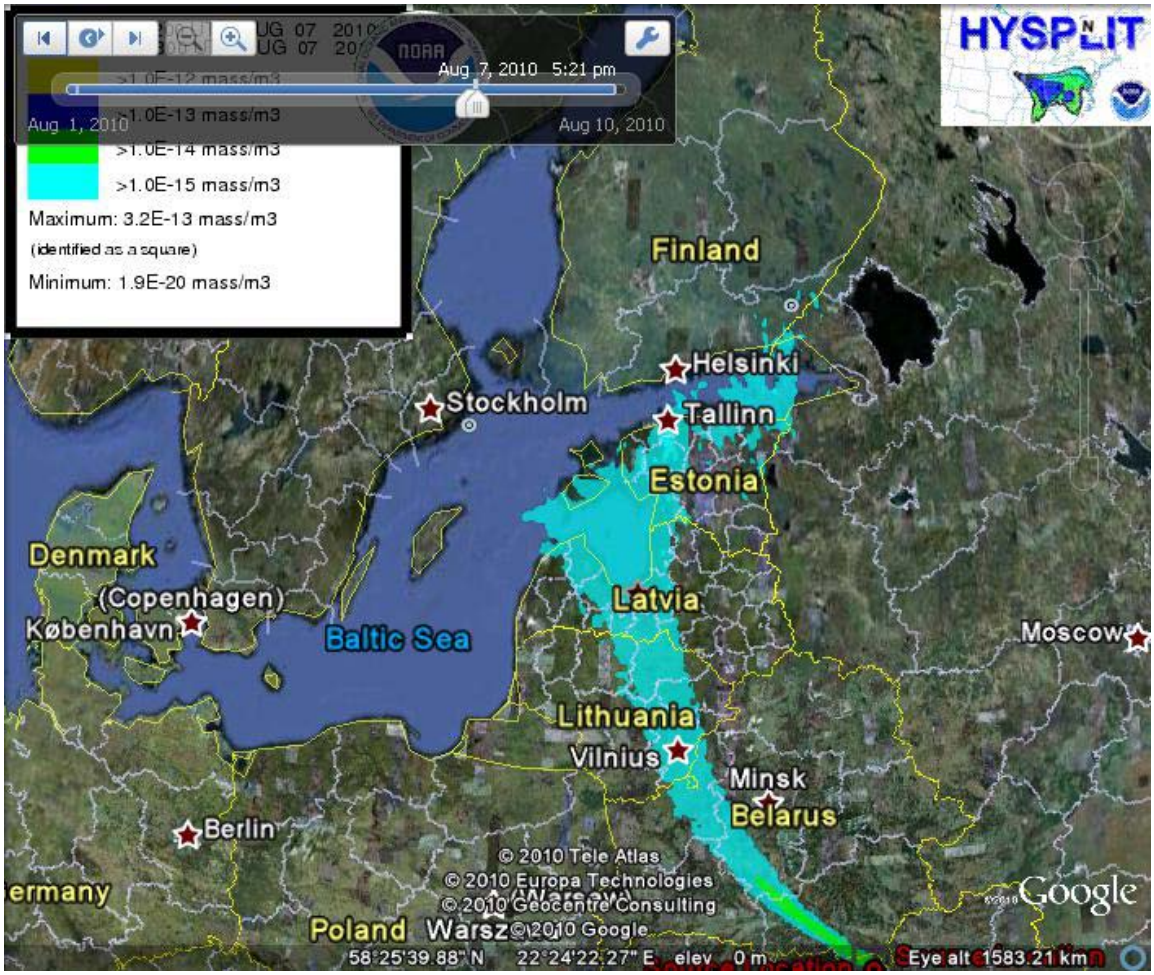
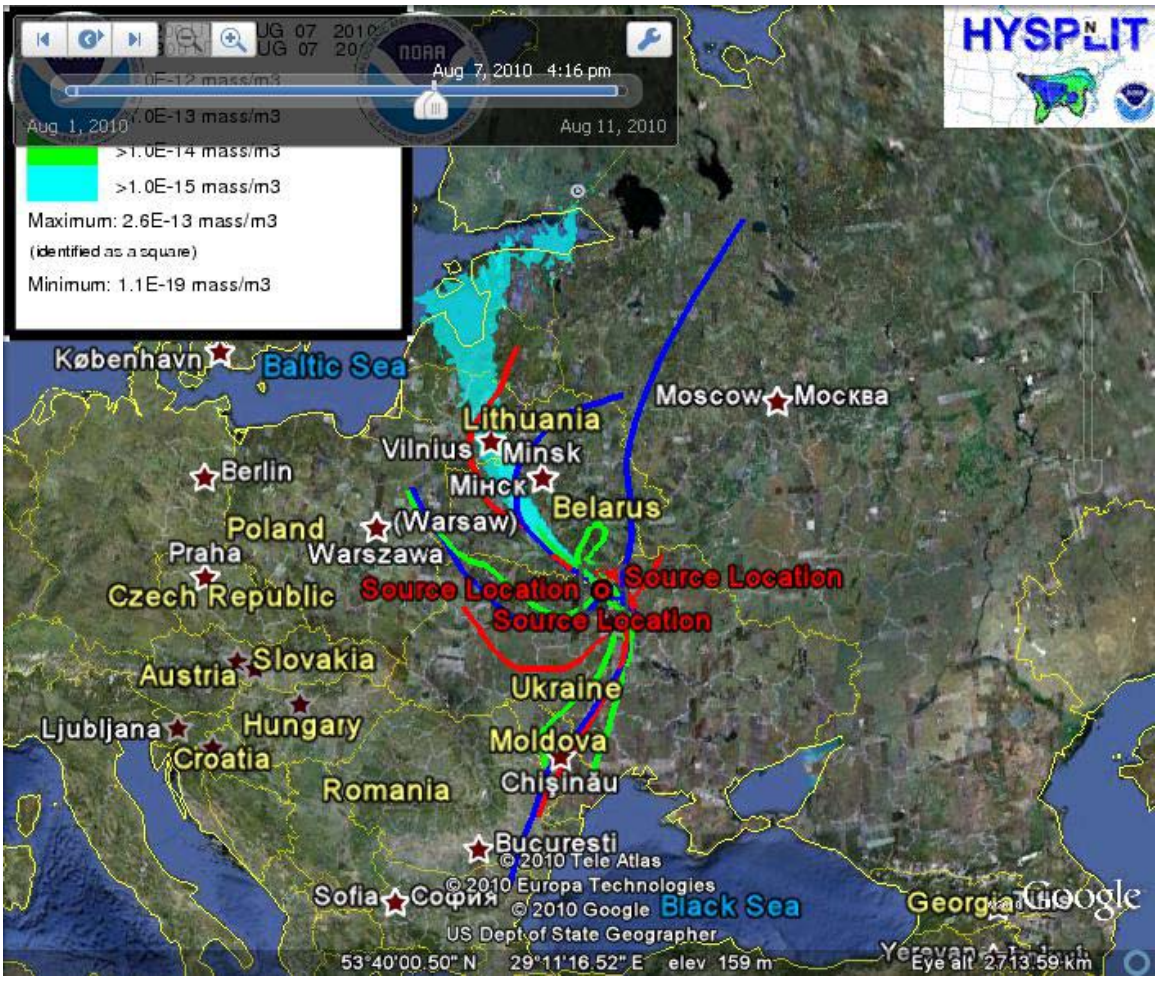


Fig 4 Trajectories with continuous releases every 12 hours from 7th August .



Dangers

The exposure to airborne radioactive fallout is a significant hazard mainly through inhalation. Material from Chernobyl (and from the Mayak area which is also a potential source) is likely to cause internal exposures to plutonium, uranium, caesium, strontium and other nuclides. The current expertise in this area, that of the International Commission on Radiological Protection is deeply flawed, and so experts who base their advice on this paradigm will be wrong. More accurate advice is to be found in the publications of the European Committee on Radiation Risk, specifically its latest 2010

report (see www.euradcom.org) (3). Internal radionuclides and especially Uranium, Strontium-90 and plutonium bind strongly to DNA in chromosomes and cause birth defects and cancer etc.
It should be noted that radiation measurements with averaging detectors like Geiger counters will not show any significant increase in radiation dose, yet the individual particles will be respirable and will cause high local doses to internal organs. Furthermore, Geiger and gamma measuring detectors (NaI) will not generally detect uranium and plutonium or strontium-90, the main hazardous nuclides. Therefore statements *that no increased levels of radiation were detected* should be questioned or taken with caution. The detection of these substances requires trapping airborne dust in filters and measurement of the filtered material using sophisticated laboratory instrumentation. Alternatively thin window scintillation counters may be employed.

Advice

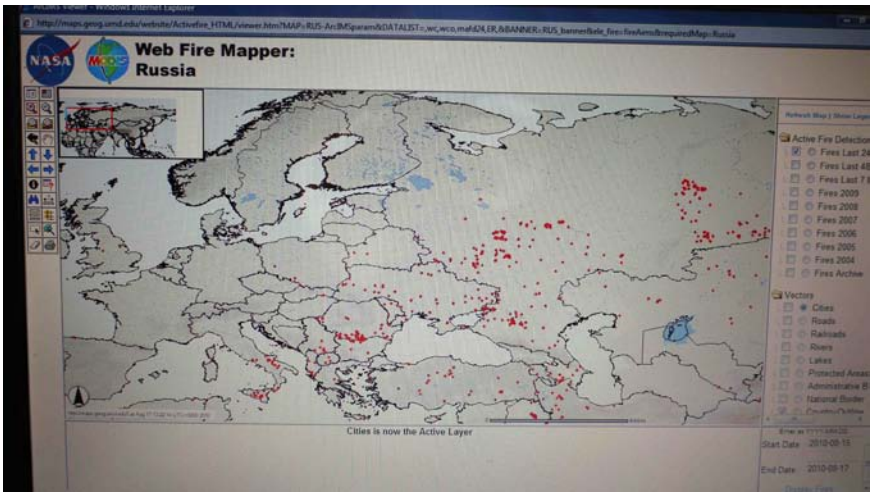
Public in areas where radioactive fallout from the Russian fires appears are advised strongly to keep indoors, keep doors and windows shut and drink only previously bottled water or milk which was obtained before the contamination episode. Inhalation of contaminated air is a significant hazard.

Assumptions and latest reports

These calculations and advice are based on the assumption that there were fires in the Chernobyl contaminated territory which were creating radioactive particles on 7th August. Different calculations can be made for different scenarios. If no fires are burning in contaminated areas then this is not a problem source.

However, fire maps obtainable from the impressive online satellite program of the University of Maryland (4) show fires in the Bryansk region of Russia.

Fig 5 Online satellite program of the University of Maryland, 24 h period 15-08-2010.



Our contacts in Belarus report on 15th August that there is a serious fight to contain fires in the Bryansk region which could, if they cannot be halted, move to the more highly Chernobyl contaminated Gomel region of Belarus with alarming consequences. The Bryansk region has radioactively contaminated peat and the smoke from the burning will therefore carry radioactive particles.

This note is intended to show what may be possible and give advice on the issue. The developments in the Russian Federation and the central regions of the Chernobyl affected territories shows the dangers associated with radioactive contamination: it is clearly a global problem since the 10 day prediction for the 7th August material takes it ultimately to China.

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15th August 2010

(1) *Draxler, R.R. and Rolph, G.D., 2010. HYSPLIT (HYbrid Single-Particle Lagrangian Integrated Trajectory) Model access via NOAA ARL READY Website (http://ready.arl.noaa.gov/HYSPLIT.php). NOAA Air Resources Laboratory, Silver Spring, MD.*
(2) *Rolph, G.D., 2010. Real-time Environmental Applications and Display sYstem (READY) Website (http://ready.arl.noaa.gov). NOAA Air Resources Laboratory, Silver Spring, MD*
(3) *ECRR2010 (2010) 2010 Recommendations of the European Committee on Radiation Risk. The health effects of exposure to low doses of ionizing radiation. Ed C.Busby, AV Yablokov, Rosalie Bertell, Inge Schmitz Feuerhake and Molly Scott Cato. Brussels: ECRR (*www.euradcom.org*)*
(4) http://maps.geog.umd.edu/activefire_html/checkboxes/rus_checkbox.htm