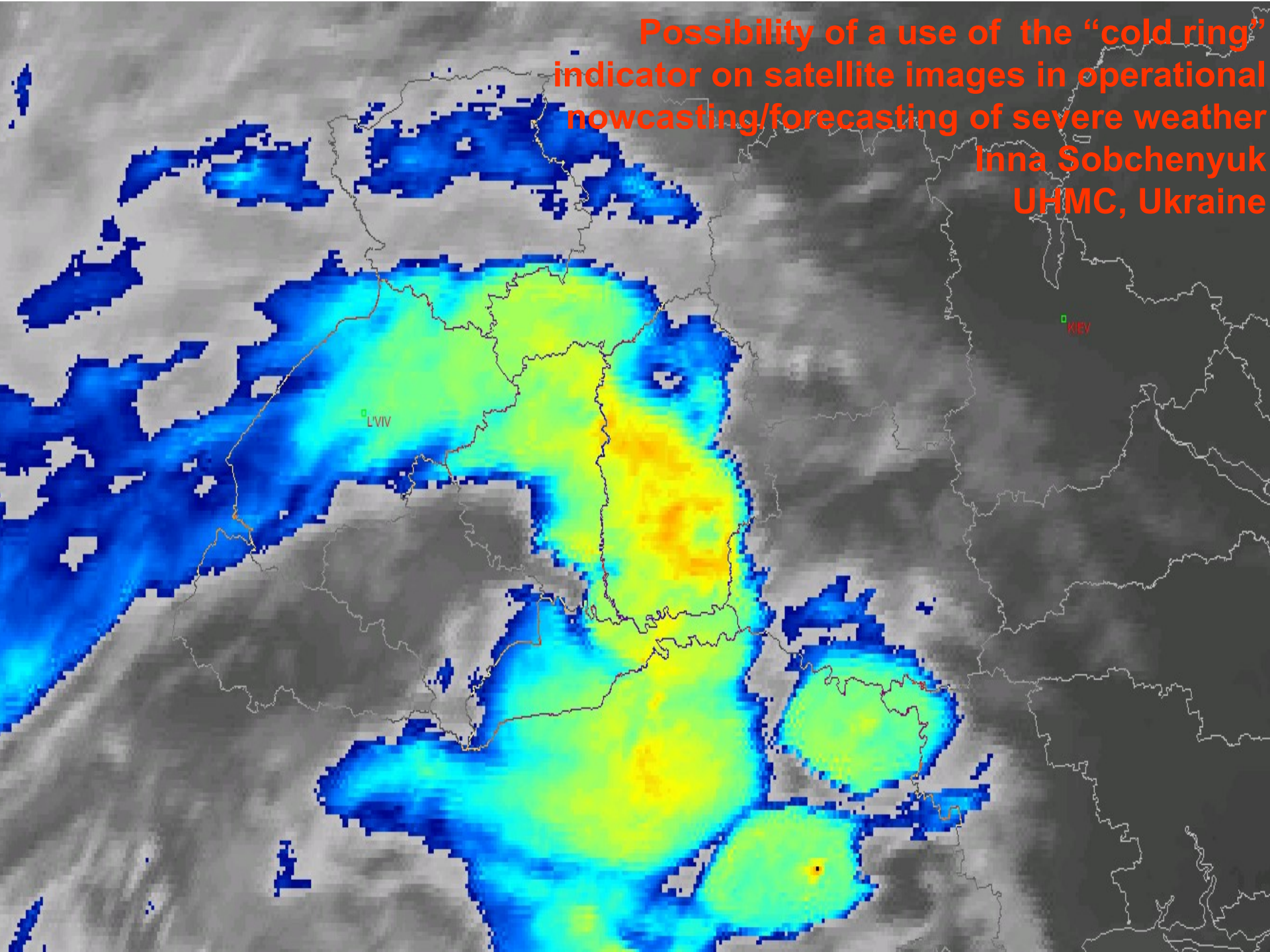

Possibility of a use of the "cold ring" indicator on satellite images in operational nowcasting/forecasting of severe weather

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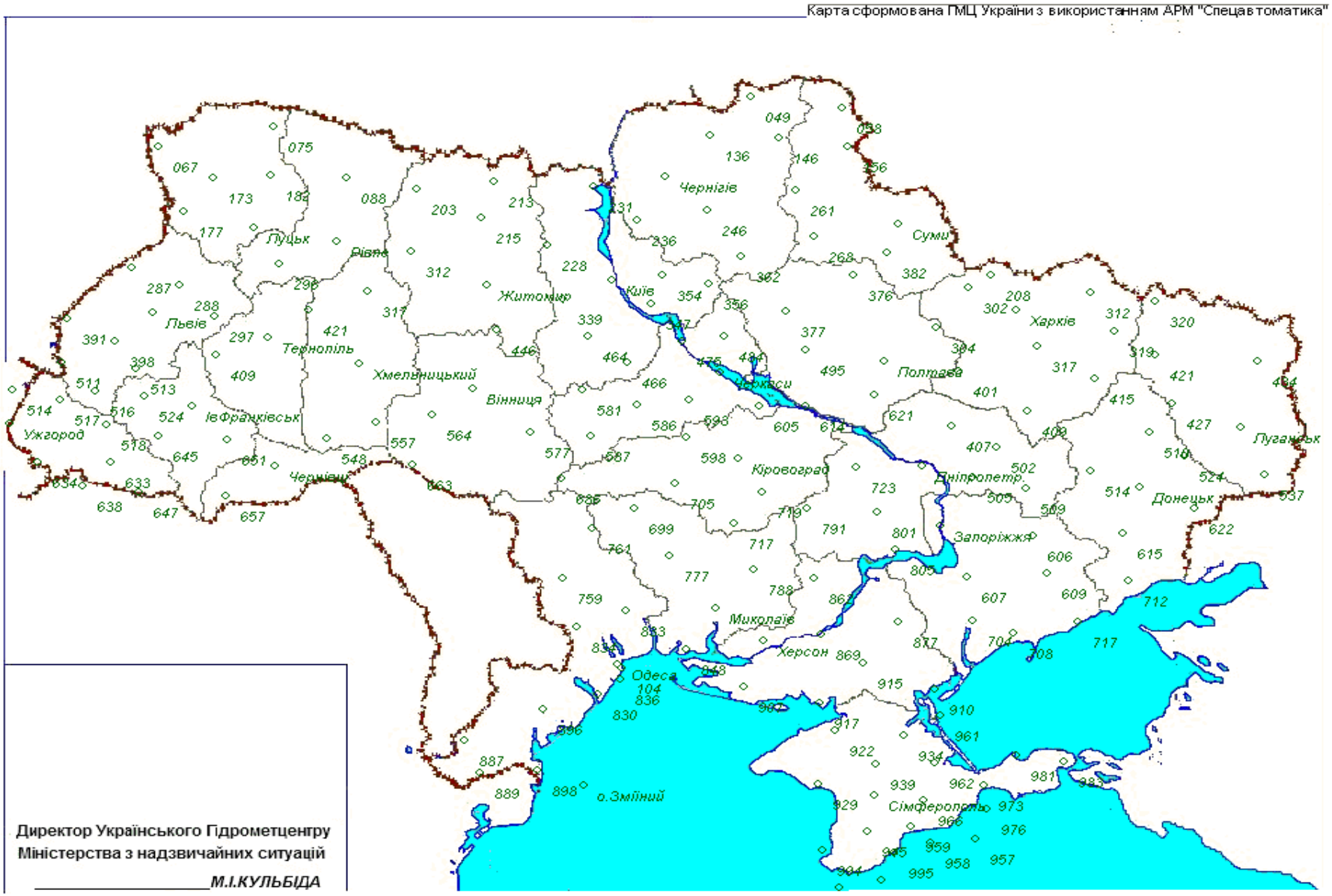
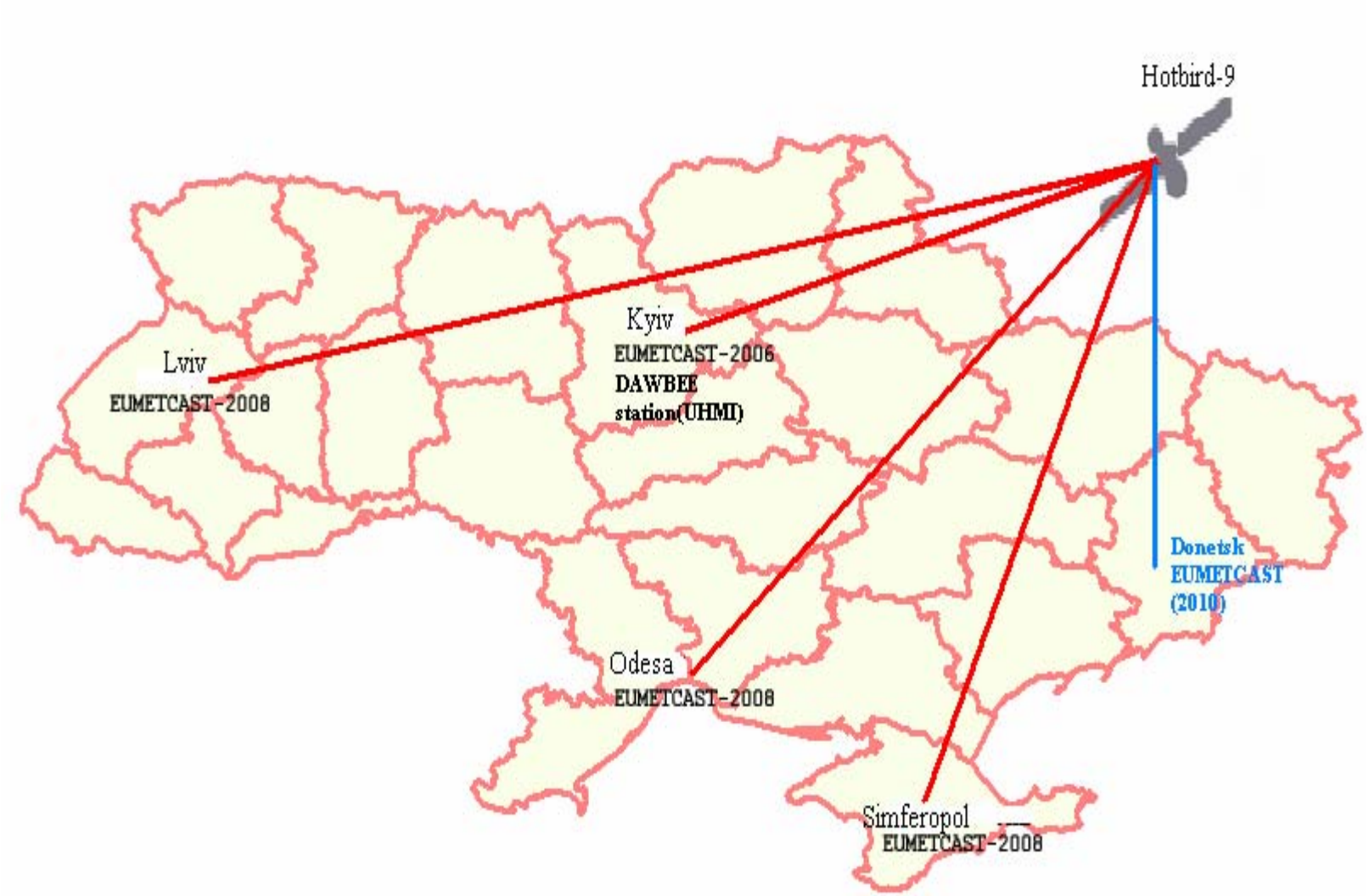
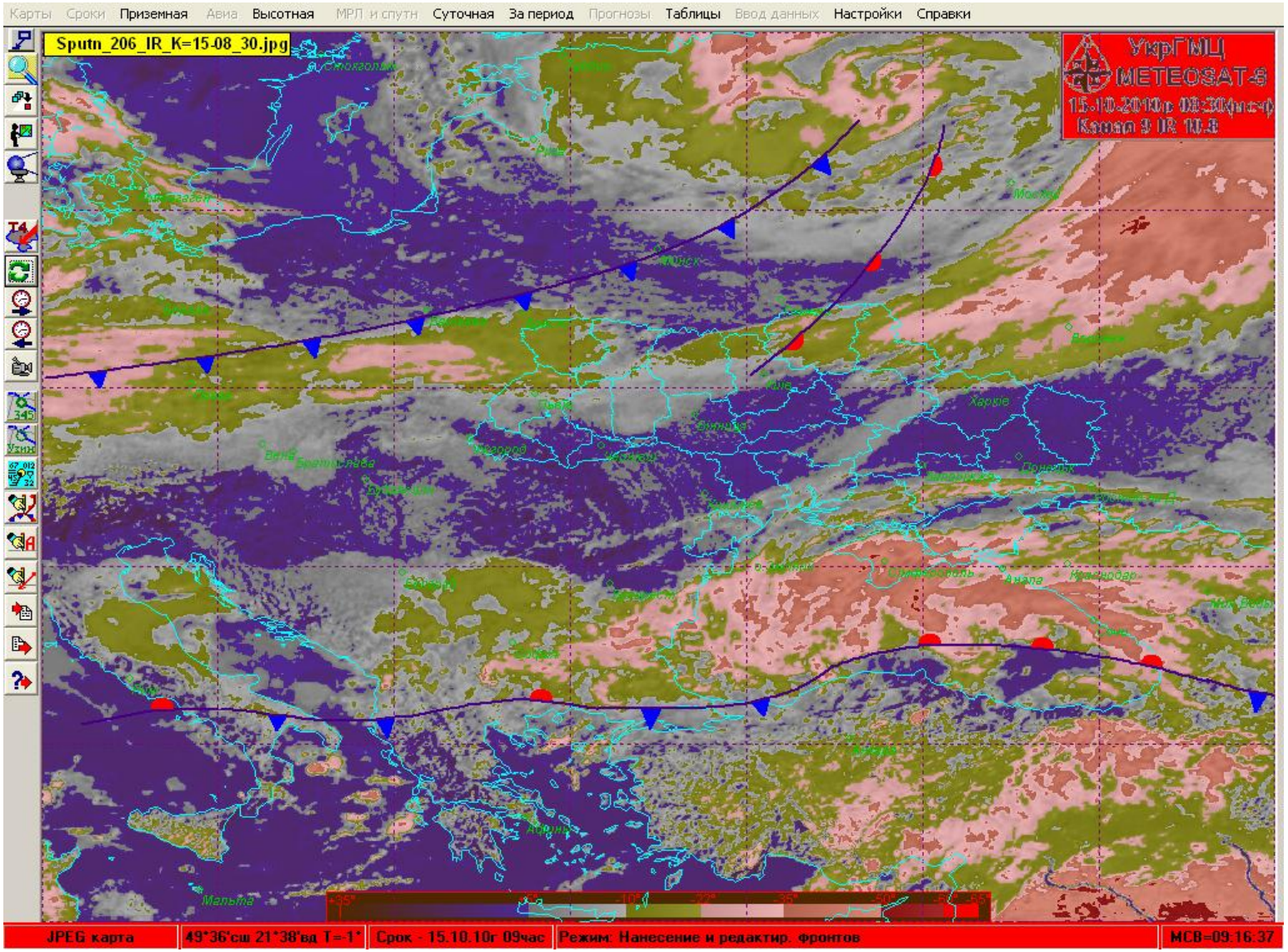
Number of meteostations



Installed reception stations



ARM synoptic



Tab1: the list of severe storms over Ukraine in july 2008 (?- missing data)

№	Date	Region	Start	End
1	2008/07/01	Sumy, Poltava	09:45	18:30
2	2008/07/03	Eastern region	12:00	16:45
3	2008/07/04	Zakarpatie	08:15	11:00
4	2008/07/04	Zakarpatie	14:15	22:15
5	2008/07/05	Odessa, Nikolayev	06:00	13:00
6	2008/07/07	Lvov	01:45	05:00
7	2008/07/07	Zakarpatie	17:00	22:00
8	2008/07/09	Dnepropetrovsk. Kirovograd	10:45	13:00
9	2008/07/14	Volyn, Rovno	14:15	02:15
10	2008/07/15	Kyiv, Chernigov	17:15	20:45
11	2008/07/17	Kirovograd, Nikolayev, Cherkassy	00:45	05:30
12	2008/07/17	Azov region, Dnepropetrovsk	06:15	08:45
13	2008/07/17	Kharkov	13:15	?
14	2008/07/18	Poltava, Sumy	12:45	19:30
15	2008/07/21	Vinnitsa, Chernovtsy, Khmelnitsky, Zhitomyr	12:30	18:30
16	2008/07/22	Vinnitsa, Khmelnitsky	20:30	00:30
17	2008/07/23	Vinnitsa, Khmelnitsky	02:45	07:00
18	2008/07/23	Vinnitsa, Odessa	09:30	13:00
19	2008/07/23	Volyn, Rovno	15:15	19:00
20	2008/07/23	Vinnitsa, Khmelnitsky	19:45	02:45
21	2008/07/24	Khmelnitsky, Zhitomyr	03:45	11:45
22	2008/07/24	West region	13:00	23:45
23	2008/07/24	Odessa, Nikolayev	21:00	03:45
24	2008/07/25	Volyn, Rovno, Zhitomyr	10:00	17:30
25	2008/07/25	Vinnitsa, Khmelnitsky	15:00	00:30
26	2008/07/26	Poltava, Cherkassy, Kyiv	03:00	05:15
27	2008/07/26	Ternopol	07:30	10:30
28	2008/07/26	Lvov, Ivano-Frankovsk	11:00	18:15
29	2008/07/27	Donetsk, Zaporozhe	10:30	05:15

Tab2: Synoptic situations of the most intensive severe storms during July 2008

Date	Synoptic situation	Localization	Severe weather
2008/07/05	Intensive cyclone, center is located over Kiev region. The min pressure is 998 hPa. Cold front passes over other parts of Ukraine. Precipitation, thunderstorms, strong wind are observed in the rear side of the cyclone.	Odessa, Nicolayev	Thunderstorms
2008/07/07	Front occlusion, which is located between two crest lines over Great Britain. Western part of Ukraine is in thewarm airmass.	Zakarpatie	Thunderstorms. Heavy rain max =40 mm
2008/07/14	Wave front is located between creast lines, which a covered all Europe.	Volyn, Rovno	Thunderstorms. Heavy rain max =60 mm
2008/07/15	Intensive wave front located between high-pressure ridge and col	Kyiv, Chernigov	Thunderstorms. Heavy rain max =36 mm
2008/07/23 -25	The cyclon is generated on 850 hPa and divided the territory of Ukraine on high and low pressure parts. Warm airmasses passes through Ukraine in south and south-east directions. High gradients of pressure and temperature was observed , because in the rear part of cyclone there are cold and in front of-warm airmasses	Khmelnitsky, Ivano-Frankovsk, Lvov, Kherson	Thunderstorms. Heavy rain max =119 mm, strong wind=40m/s, hail.
2008/07/27	Upper level low over Odessa region, which moves on the eastern and north-eastern directions	Donetsk, Zaporoshe	Thunderstorms. Heavy rain max =60 mm, strong wind=25 m/s, hail=20mm

Tab 3

№	Date	$t°_{max}$ - begin	$t°_{max}$ - middle	$t°_{max}$ - end	$t°_{ed}$ on edges	Duration on hours	$t°_{min}$ - $t°_{ed}$	Regions of spreading
1	2008/07/05	-60,9	-60,4	60,4	-45	7	-15	>2 reg
2	2008/07/07	-56,0	-63,9	-50,5	- 45	5	-15	>3 reg
3	2008/07/14	-60,4	-63,3	-59,7	-50	12	-20	>6 reg
4	2008/07/15	-55,4	-61,3	-59,5	-48	3,5	-15	= 2 reg
5	2008/07/23	-56,2	-59,0	-54,1	-48	5	-9	>2 reg
6	2008/07/23	-56,0	-60,5	-62,5	-49	3,5	-11	>2 reg
7	2008/07/23	-60,9	-63,3	-61,3	-55	4	-7	>3 reg
8	2008/07/23	-59,7	-61,7	-62,8	-50	7	-11	>3 reg
9	2008/07/24	-60,9	-62,9	-60,2	-55	8	-8	>5 reg
10	2008/07/24	-60,7	-61,7	-60,3	-55	7	-7	>6 reg
11	2008/07/24	-64,1	-62,5	-61,1	-50	4	-14	>4 reg
12	2008/07/25	61,7	62,6	-62,1	-57	7	-7	>6 reg
13	2008/07/25	-60,9	-61,3	-61,7	-55	7	-6	>6 reg

- In order to define some parameters, which could be used in foracasting/nowcasting of severe storm, we analized the following of them (tab3):
- $-t°_{min(s)}$ – max temperature when 'cold ring' clear visible on the image (based on M.Setvak color palette scale);
- $-t°_{min(m)}$ – max temperature when severe storm is in mature stage of developing;
- $-t°_{min(e)}$ – max temperature when severe storm start to disappear;
- $-t°_{min(m)}\ -t°_{ed}$ – temparature difference;

- Our analysis shows that $t°_{maxs}$ begins mostly from 60.0°C, only in few cases 'cold ring' or U,V shapes were visible when $t°_{maxs}$ was lowed than 60.0°C. $t°_{maxm}$ in all cases was more than 60.0°C and temperature range was only about 4°C (from 60.0°C to 63.9°C). $t°_{maxe}$ also in most cases was close to 60.0°C or more. $t°_{ed}$ is varying from 45.0°C to 57.0°C as well as $t°_{maxm}$ -$t°_{ed}$ from 6.0°C to 15.0°C.
- We have not found any relation between analyzed parameters and duration of severe storm and it's severity. From our point of view it is more complex problem and demand all available meteorological information.

Thank you for your attention