

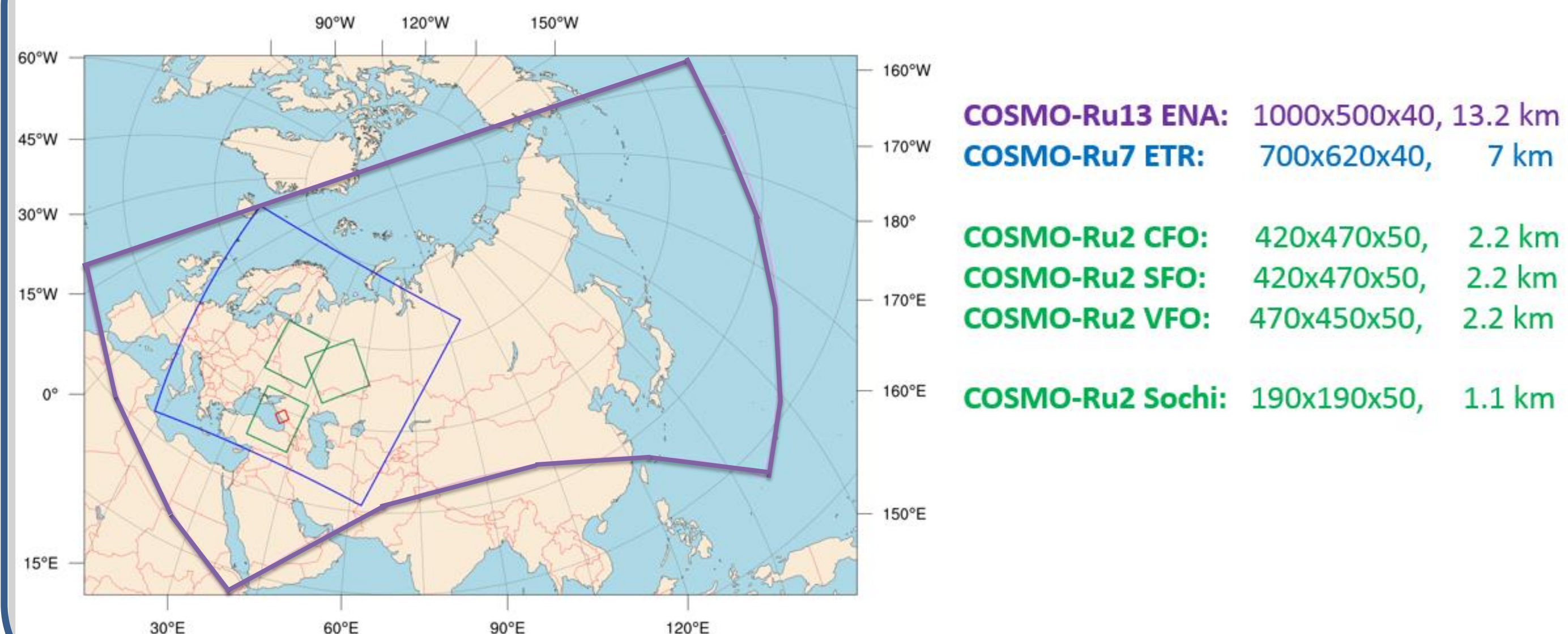


Adaptation and modification of the weather forecasting system COSMO-Ru using the super computer Cray-XC40-LC in configuration of COSMO and ICON-LAM models

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Operational system of numerical weather prediction COSMO-Ru (which currently used in the Hydrometcenter of Russia) as the components utilizes different configurations of the basic COSMO model for different integration domains with horizontal grid spacing 1.1, 2.2, 7 and 13.2 km.

HMC of Russia: COSMO-Ru domains for cluster SGI ICE-X



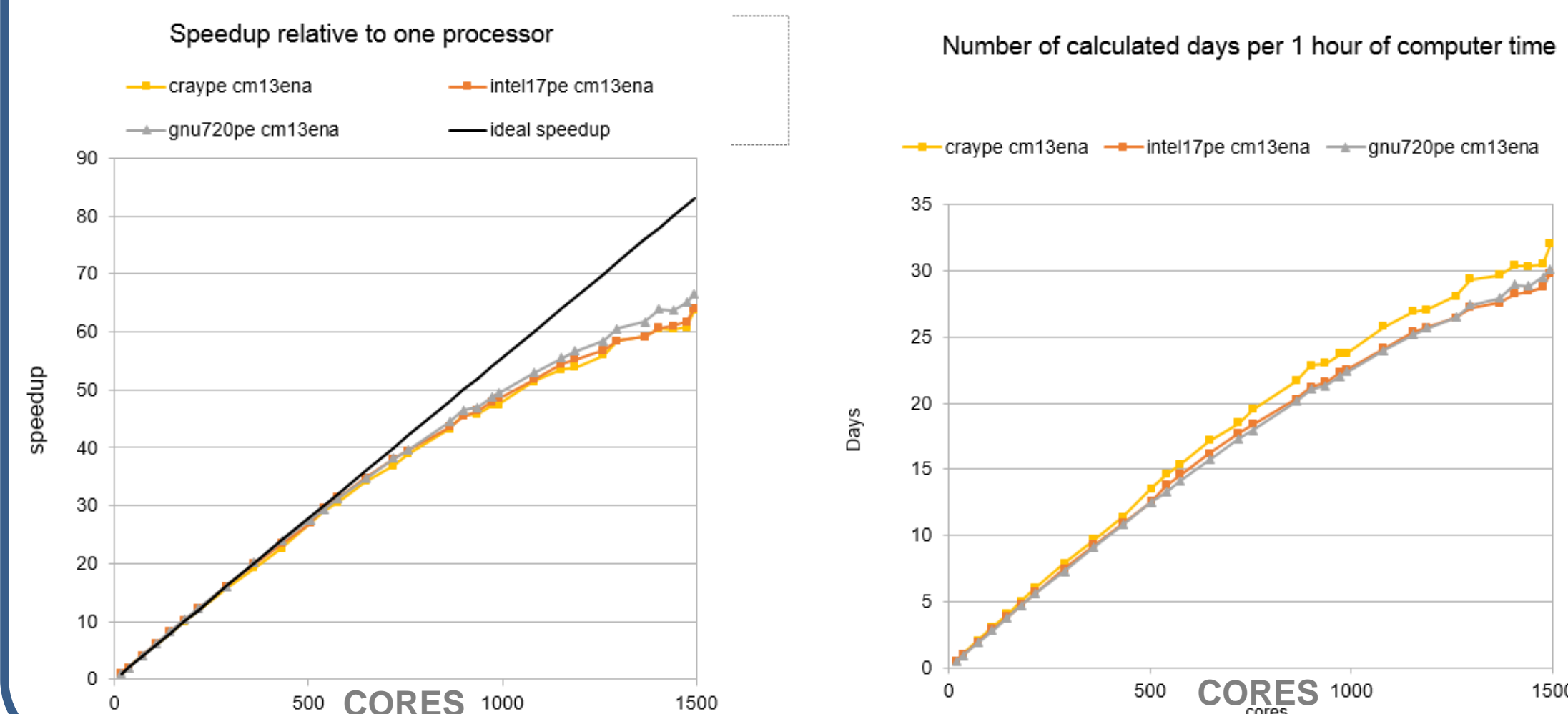
Occurrence of Cray-XC40 supercomputer required conducting numerical experiments:

- to investigate applicability of different compilers,
- choosing the optimal decomposition for paralleling of computational process,
- changing the integration domains, which could allow to develop the product visualization on the basis of NCL language instead of GrADS,
- to start transition from the COSMO model to ICON-LAM.

At the first stage after transfer COSMO-Ru system with COSMO-RuENA configuration to Cray-XC40, the grid spacing was decreased two times and become 6.6 km and 78-hours forecasts has run 4 times every day.

INVESTIGATION OF DIFFERENT COMPILERS

Speed-up: int2lm COSMO-Ru13ENA for compilers craype, intel17, gnu720 Days for 1 hour of run

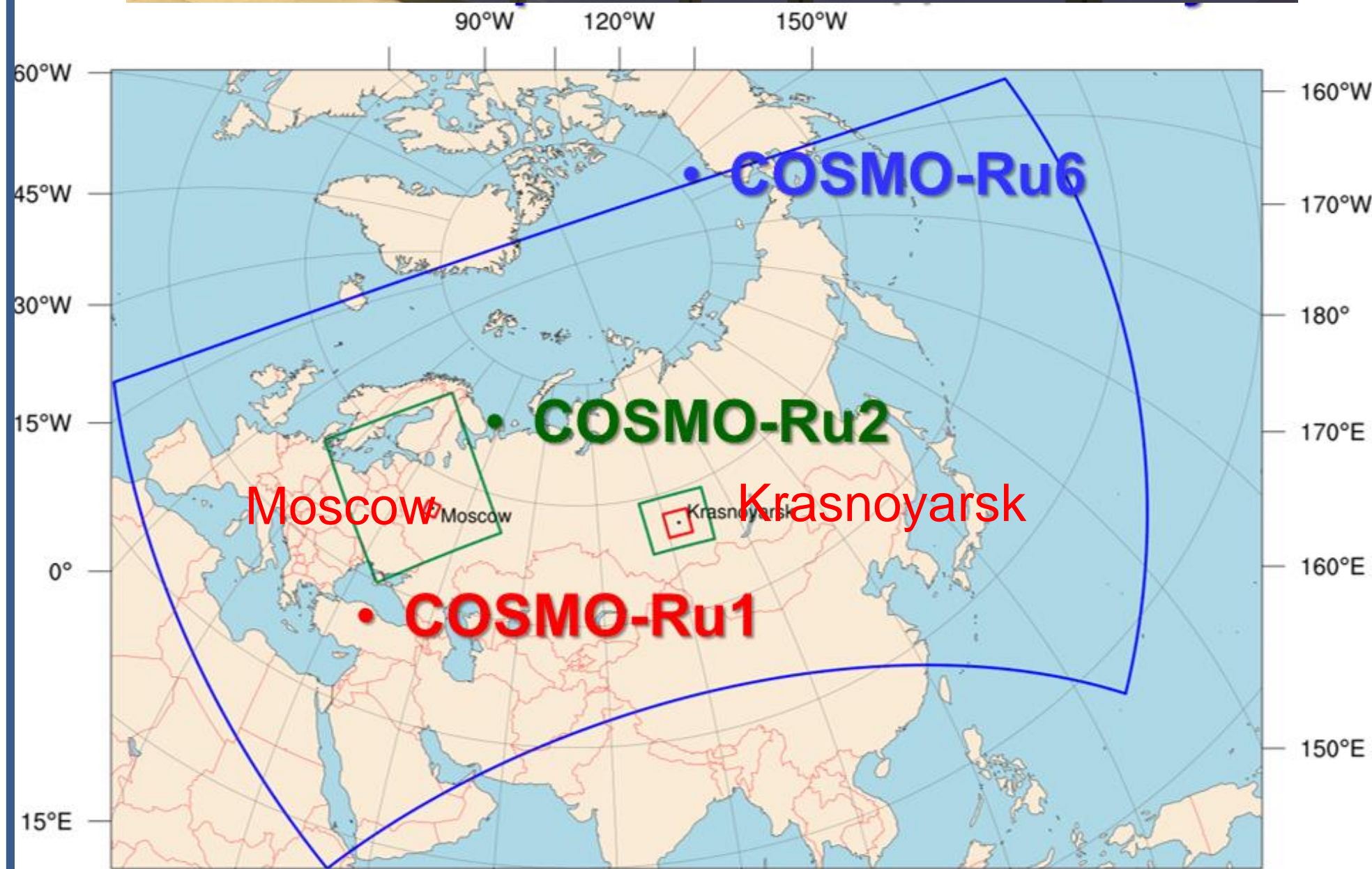


TIME OF RUN AS FUNCTION FROM CORES

CORES	TIME OF RUN	DECREASE OF TIME
FORECAST, 48 h (2 days)		
180	1900 s = 31.67 min	1
360 = 180 × 2	850 s = 14.17 min	2.24 ≈ 2
720 = 180 × 4	480 s = 8 min	3.96 ≈ 4
1440 = 180 × 8	300 s = 5 min	6.33 ≈ 6
FORECAST, 120 h (5 days)		
1440 = 180 × 8	684 s = 11.4 min	6.94 ≈ 7

CORES	TIME OF RUN	DECREASE OF TIME
FORECAST, 06 h (0.25 day)		
180	570 s = 9.5 min	1
360 = 180 × 2	242 s = 4.3 min	2.36 ≈ 2
720 = 180 × 4	138 s = 2.3 min	4.13 ≈ 4
1440 = 180 × 8	91 s = 1.5 min	6.26 ≈ 6
FORECAST, 48 h (2 days)		
1440 = 180 × 8	684 s = 11.4 min	6.67 ≈ 7

CORES	TIME OF RUN	DECREASE OF TIME
FORECAST, 03 h (0.125 day)		
180	1242 s = 20.7 min	1
1440	1242 s / 6.7 = 186.2 s = 3.1 min	if 6.7
FORECAST, 72 h (3 days)		
2880	1242 s × 24 / 12 = 2484 s = 41 min	if 12



COSMO-Ru domains for Cray

