Bulletin GPoM-epidemiologic no 4

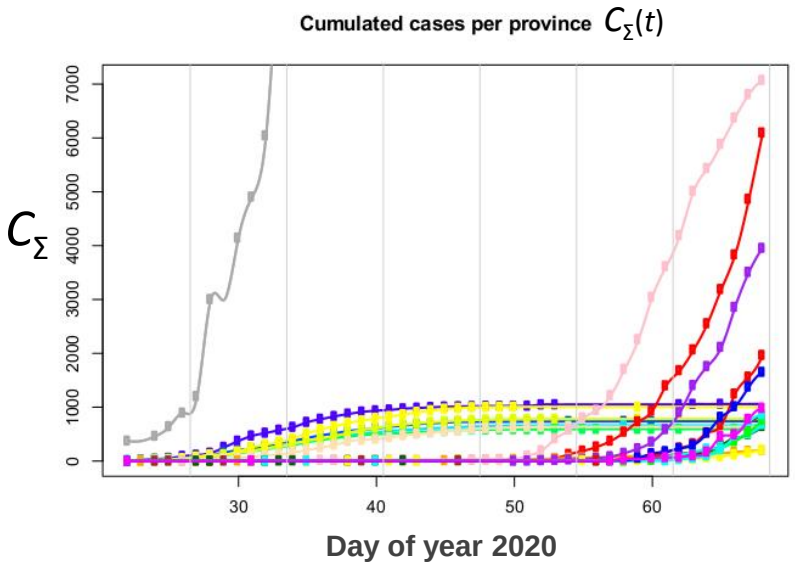
Coronavirus Covid-19 epidemic (2019-2020)

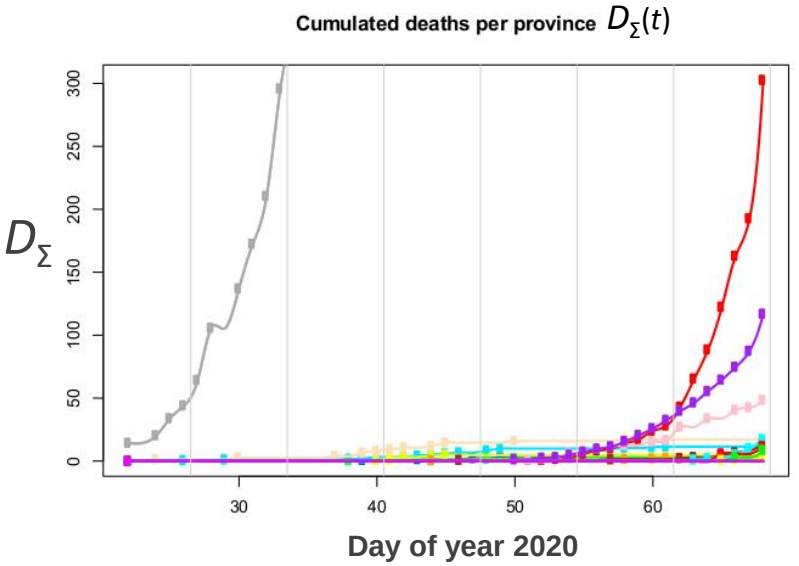
9 Mars 2020

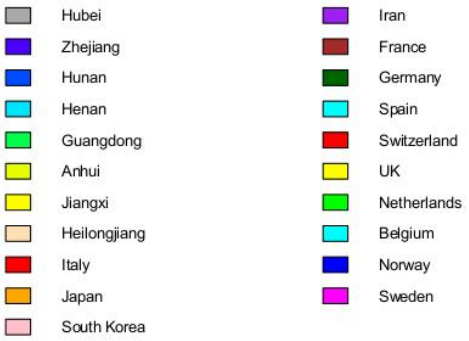
CESBIO

ASTRE
AnimalS health
Territories Risks Ecosystems

Culumated cases and deaths (*normalized* to 50 000 000)







Data from CSSE JHU

Recent Evolutions

Data from the CSSE (Johns Hopkins University) were used to perform the present analysis. To make the provinces and contries intercomparison possible, a normalization was applied (50 Millions inhabitants taken as reference)

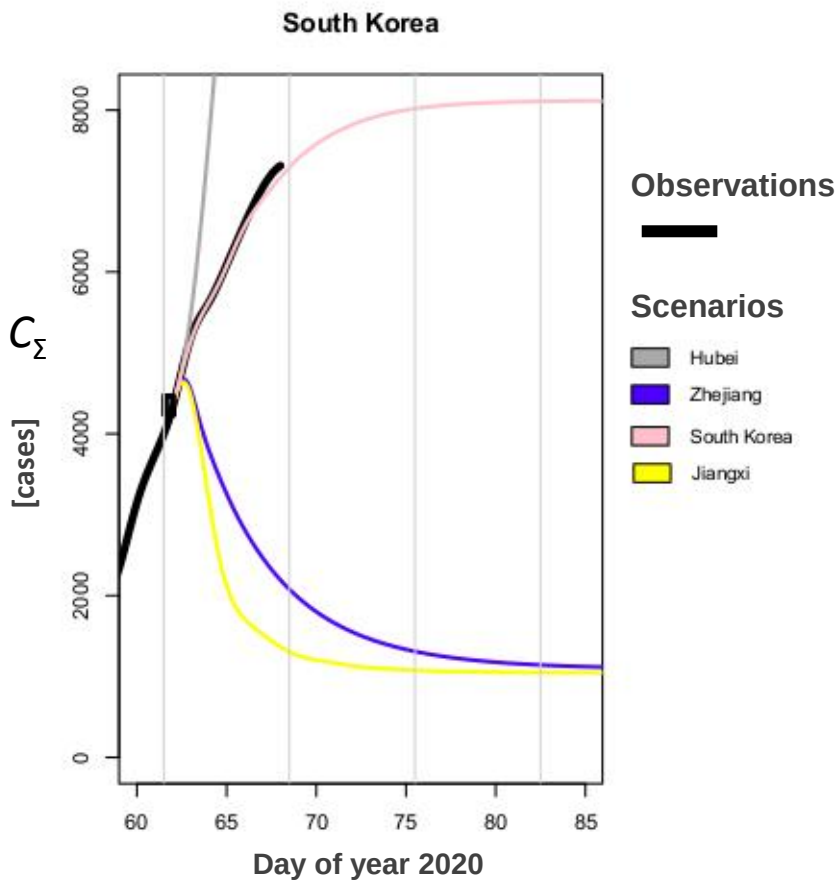
CHINA

- The number of cumulated confirmed cases is still increasing in the Hubei province with still a significant additional new cases each day (<150 per day during the last three days)
- A few additional confirmed cases were also detected in Gansu and Beijing provinces (<4 per day) in the last days
- The epidemic is apparently under control in all the other provinces (no new cases)

OTHER COUNTRIES

- There are three very active focuses in South Korea, Iran and Italy
- Numerous new focuses have appeared in Europe

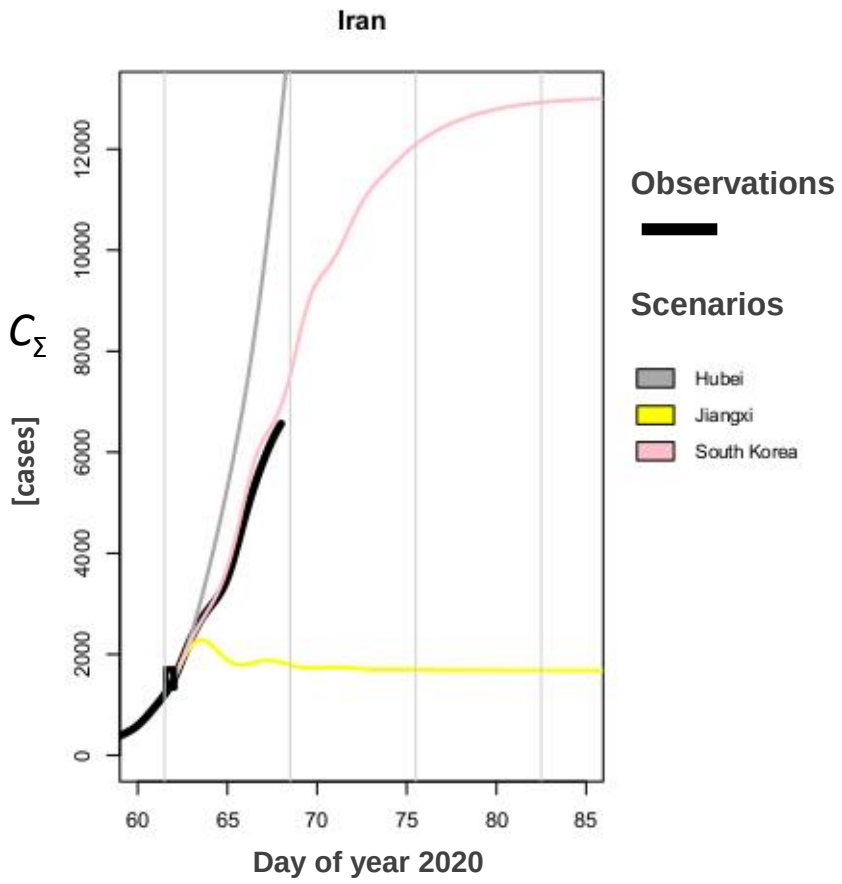
Observed and simulated cumulated cases in South Korea considering four scenarios



South Korea

- The outbreak in South Korea has apparently reached its maximum progression speed and is now reducing progressively.
- This slowing down very likely results from the active measures for containing risks
- A model could be obtained emprically for South Korea (model of canonical form based on the global modelling technique).
- The stabilization (99.5% of infectious cases) is expected to be reached by the end of March (DoY 88) with a total number of infections estimated larger than 8 000 cases.
- An evolution of this scenario cannot be excluded at present

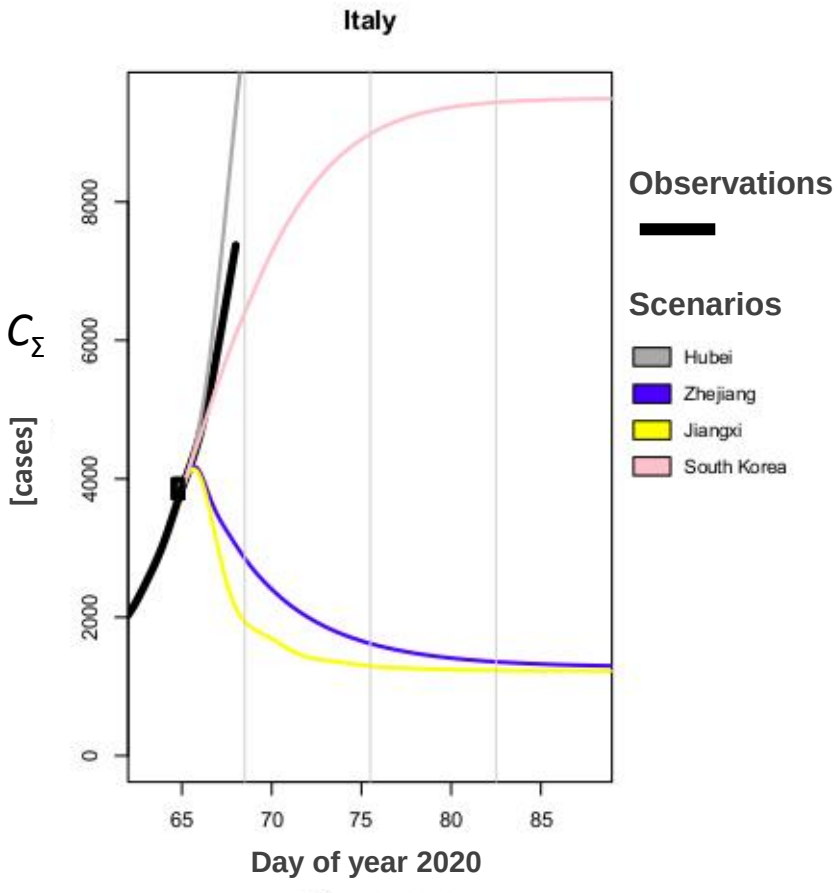
Observed and simulated cumulated cases in Iran considering three scenarios



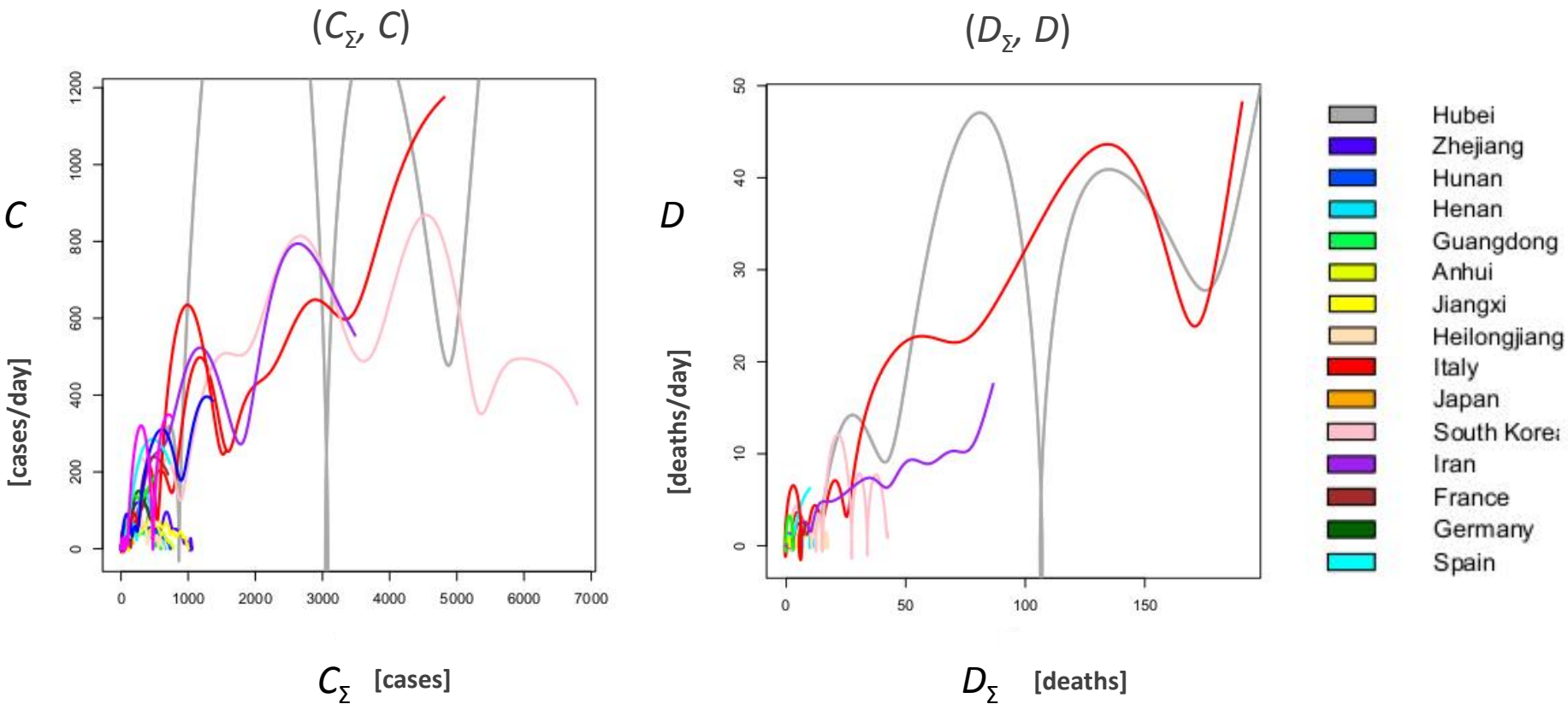
Iran

- The outbreak in Iran is still in quick progress.
- No model could be obtained for this focus yet
- Three scenarios could be run (other possible scenarios could not, and were rejected). The South Korean scenario is presently the most probable one.
- Based on it, the stabilization is estimated to be in progress. Peaks of cases may reach a maximum of 1500-1600 new infections per day and would lead to a total number of infections around 13000 cases.
- A quick evolution of this scenario should however not be excluded, considering the recent increase of deaths

Observed and simulated cumulated cases in **Italy** considering four scenarios



Phase portraits (C_Σ,C) and (D_Σ,D) per province/country (coronavirus Covid-19)



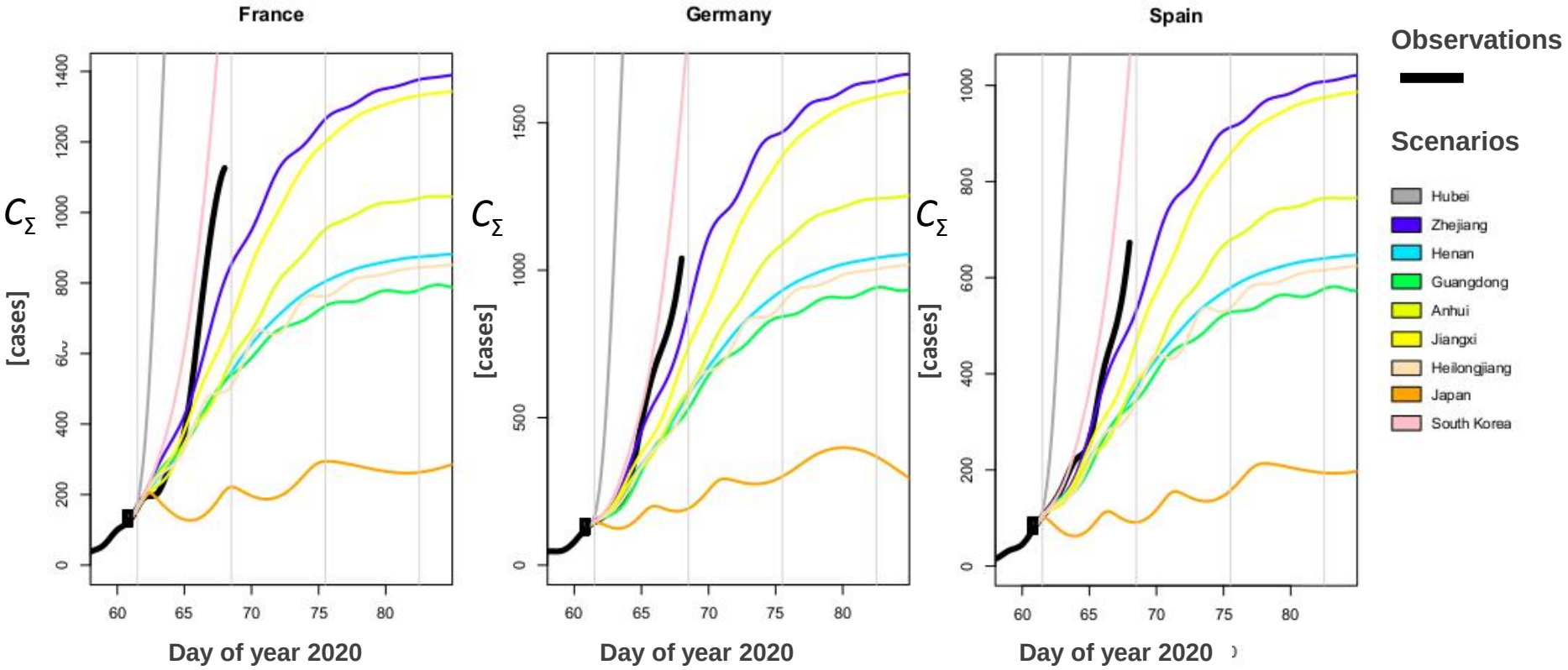
Italy

- The outbreak in Italy is in quick progression. No model could be obtained for it yet
- Four scenarios could be run (others were rejected). At present, considering both the recent evolution in the phase space and the modelled sceanarios, Italy appears to be closer to the Hubei scenario than to the South Korean one
- These two scenarios are quite different:

- **Peaks** of cases estimated on **period** (in DoY): 65-71 (S.Korea), 69-85 (Hubei)
- With **maximum new cases per day** around: 800 (S. Korea), >5000 (Hubei)
- **Total number of infections** at the end: 9500 (S. Korea), >75000 (Hubei)

- Evolutions of this situation cannot be excluded in the days to come, in particular because of different measures that have been taken to contain the epidemic at the three areas (Italy, South Korea and Hubei)

Observed and simulated cumulated cases in France, Germany and Spain considering nine Asian scenarios



France, Germany and Spain

- The outbreak in France, Germany and Spain is in relatively quick progression. No model could be obtained for them yet
- Nine scenarios could be run. At present, the three contries are in between the South Korean and the Zhejiang scenarios, the former one being the more probable
- Based on the South Korean scenario, it is estimated that:

- **maximum new cases per day** may reach:

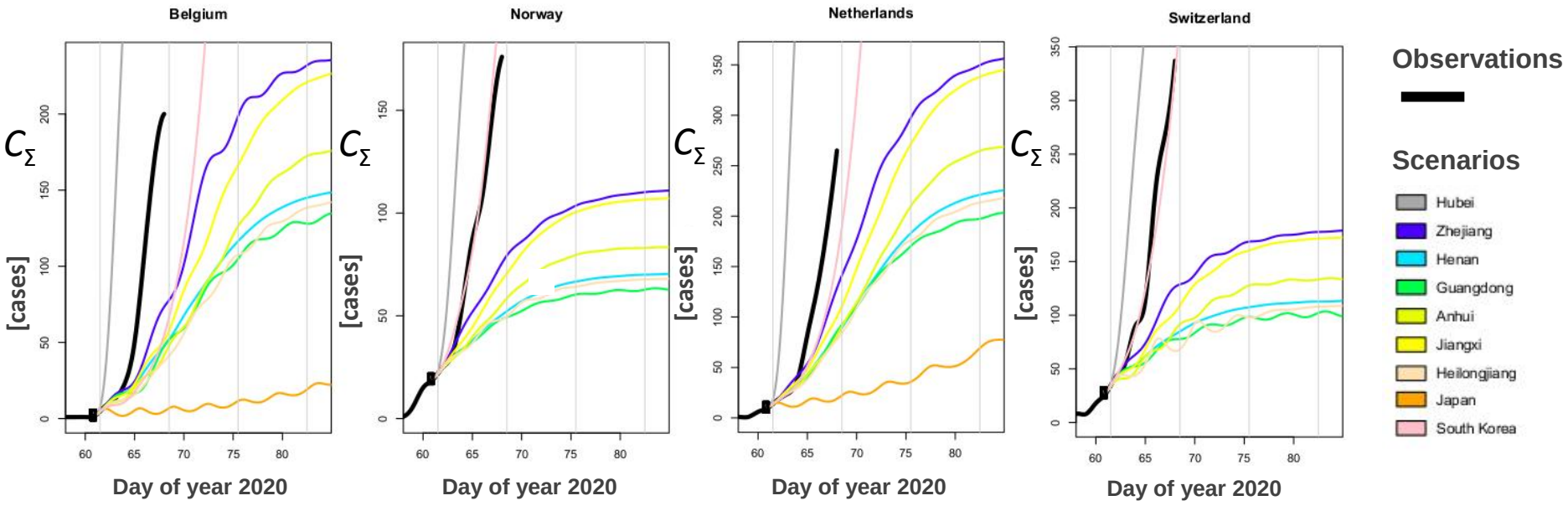
  900 (in France), 1100 (in Germany), 650 (in Spain)

- **Total number of infections** at the end:

  >10000 (in France), >12000 (in Germany) >7500 (in Spain)

- Evolutions of this situation cannot be excluded in the days to come. Note in particular that the scenario in Italy was in a similar scenario a few days ago. It has quickly evolved in a few days and is now closer to the Hubei scenario

Observed and simulated cumulated cases in Belgium, Norway, Netherlands and Switzerland considering nine Asian scenarios



Belgium, Norway, Netherlands and Switzerland

- A very quick progression has been observed in Belgium, Norway, Netherlands and Switzerland in the last couple of days. No model could be obtained for them yet
- At present, the South Korean scenario appears the most probable in each case
- These results should be taken with some caution because the size of these four contries is much smaller than the size of the countries and provinces from which the scenarios were generated. Different scale processes may therefore be expected.
- The evolution should be monitored carrefully in the days to come to confirm this trend

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