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Research article

Geographical network model for COVID-19 spread among dynamic epidemic regions

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Supplementary

The evolution in time of dynamical epidemic regions from July, 2020, until February, 2021 is shown on Figure S1. Similarities between epidemic and administrative regions is observed (see administrative regions in the source manuscript corresponding to this supplementary material).
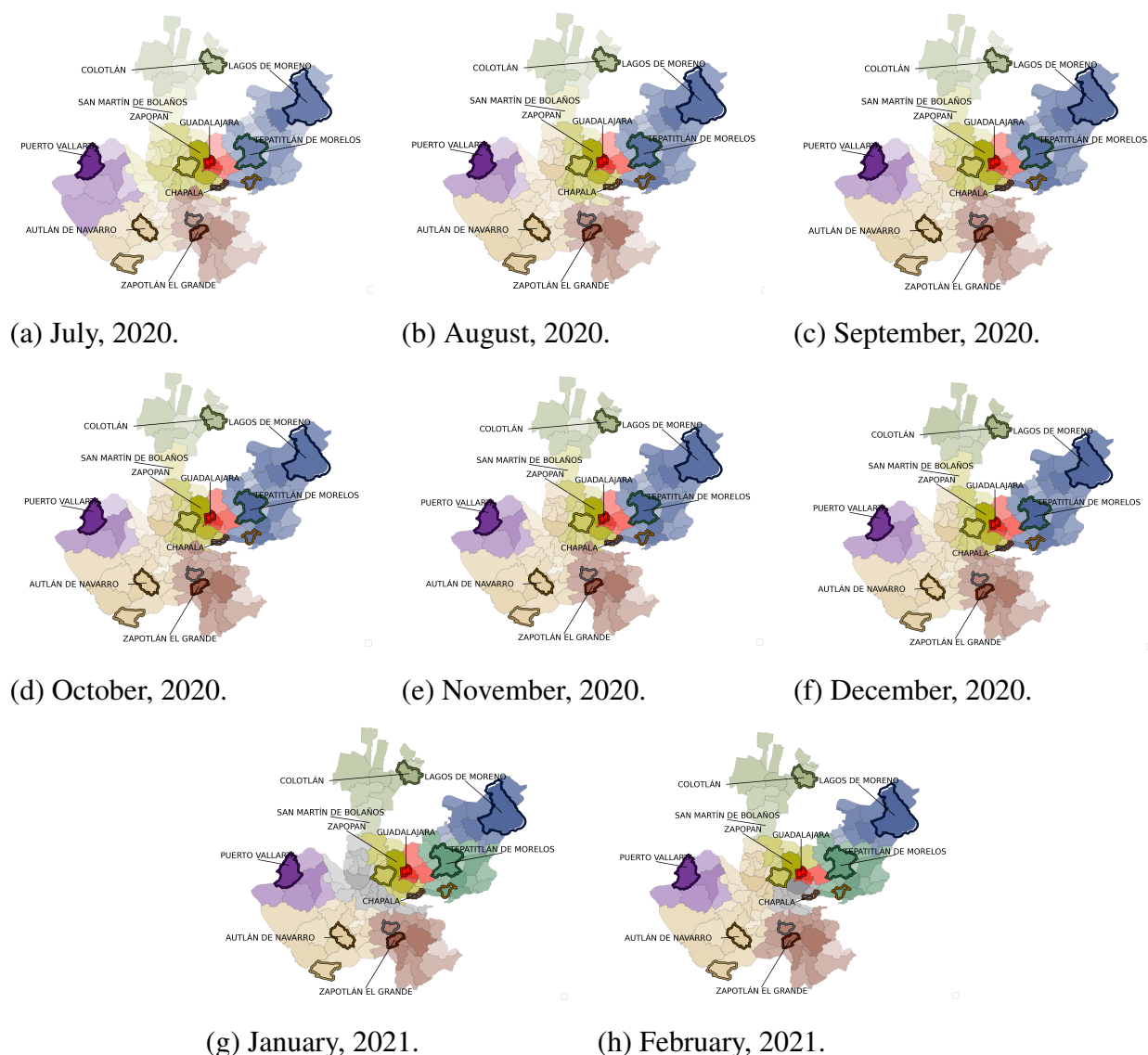
(a) July, 2020.

(b) August, 2020.

(c) September, 2020.

(d) October, 2020.

(e) November, 2020.

(f) December, 2020.

(g) January, 2021.

(h) February, 2021.

Figure S1. Division of Jalisco state on epidemic regions according to Louvain algorithm and active cases at the end of every month, from July to February.

Estimates from ERSEIR model and their comparison against contagion data from September, 2020, until February, 2021, are shown on Figures S2–S7. It is observed that RRMSE for whole state is consistently below 10% in most of cases. Only in January the RRMSE increases to 15%, and this is previous to the increasing in the number of epidemic regions on February.

In general, it is observed that main differences or largest values of RRMSE, obey to two main factors: first, the epidemic regions weights constancy assumption. This is, it is assumed that weights between epidemic communities do not vary significantly within a month. Then, better results could be obtained by reducing the time up to epidemic regions update, from one month to 15 days for instance. As second factor, largest RRMSE are observed in epidemic regions with low infectious, that means that local outbreak dynamic is not completely defined in contrast with epidemic regions with high infectious, where better estimates are obtained.
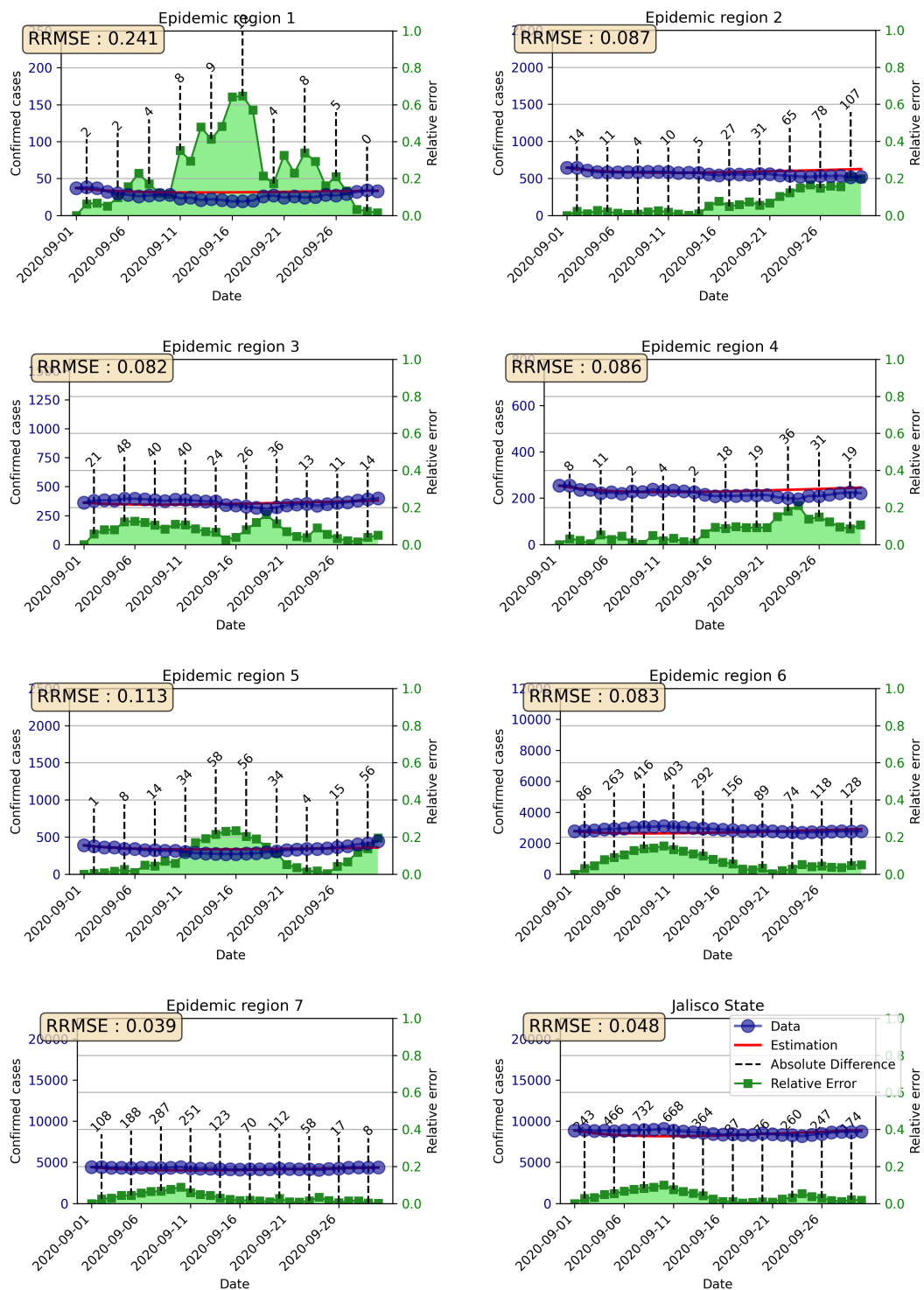
Figure S2. Daily estimating results from September 1, until September 30, 2020. obtained from ERSEIR implementation are presented in red lines, for each epidemic region and for Jalisco state. Active cases data (source [1]) are drawn on blue line with circular marks. Relative error is computed for every day and drawn on green with squared marks and values corresponds to right axis. Numbers over dashed black lines indicates the absolute error.
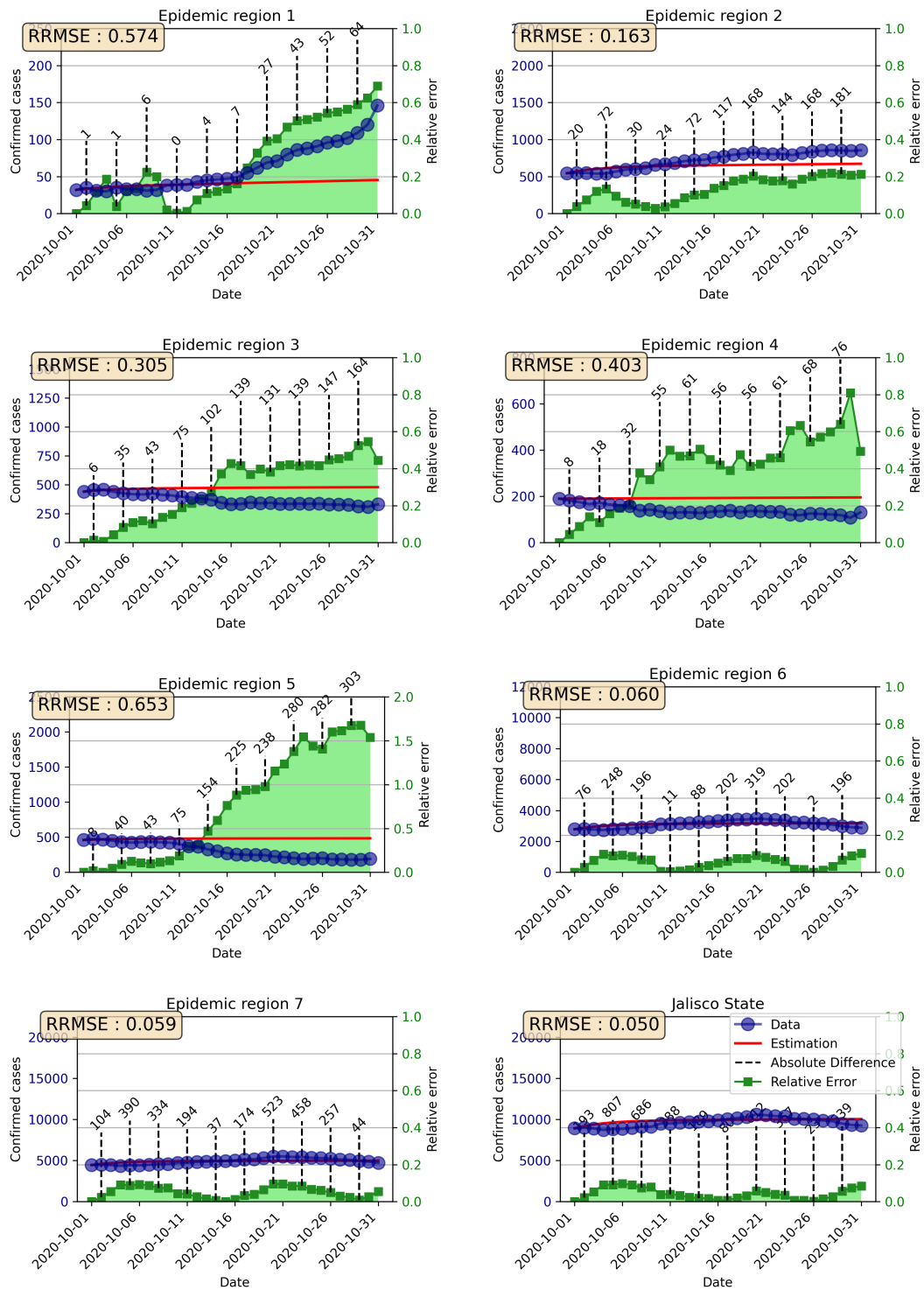
Figure S3. Daily estimating results from October 1, until October 31, 2020. obtained from ERSEIR implementation are presented in red lines, for each epidemic region and for Jalisco state. Active cases data (source [1]) are drawn on blue line with circular marks. Relative error is computed for every day and drawn on green with squared marks and values corresponds to right axis. Numbers over dashed black lines indicates the absolute error.
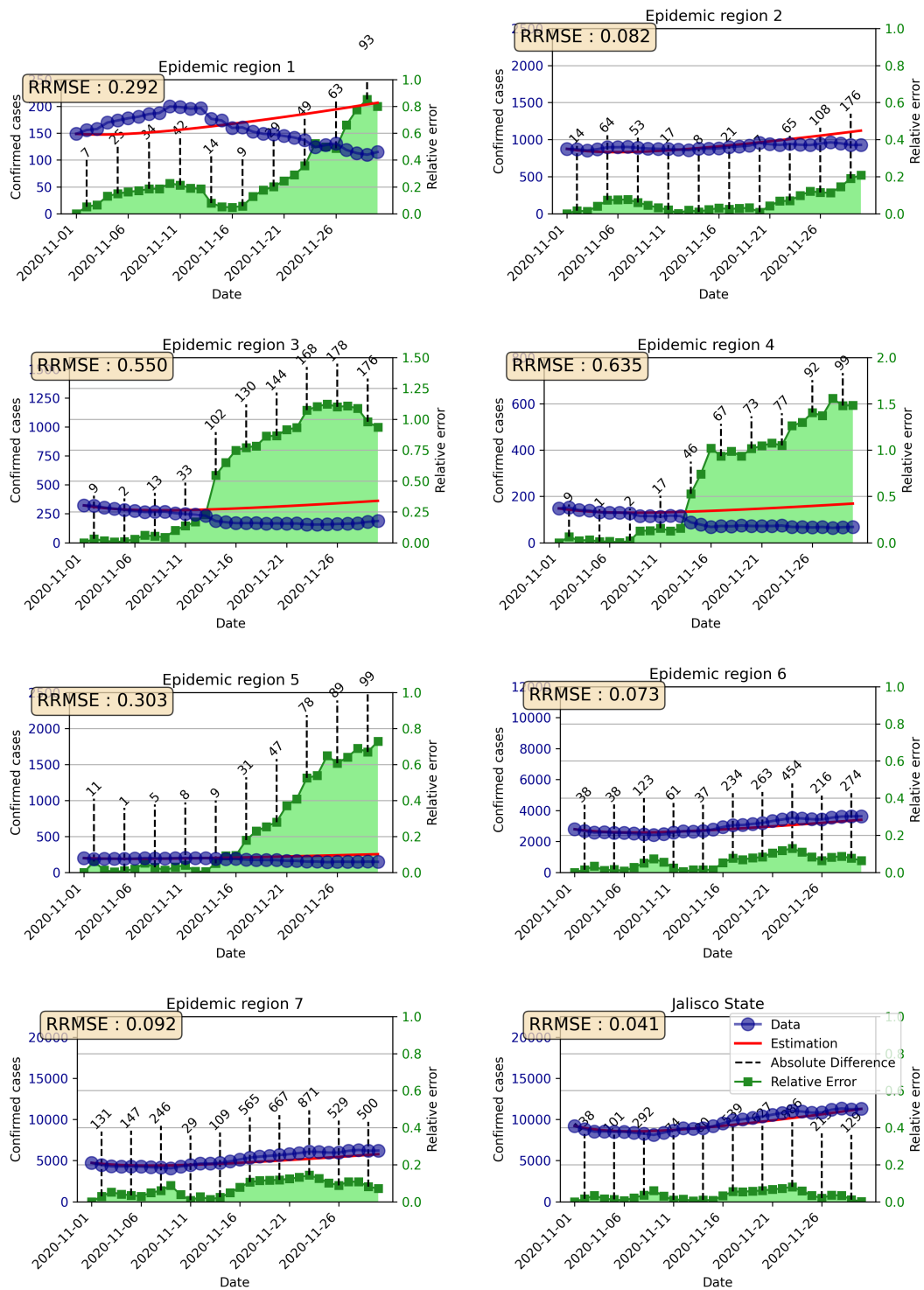
Figure S4. Daily estimating results from November 1, until November 30, 2020. obtained from ERSEIR implementation are presented in red lines, for each epidemic region and for Jalisco state. Active cases data (source [1]) are drawn on blue line with circular marks. Relative error is computed for every day and drawn on green with squared marks and values corresponds to right axis. Numbers over dashed black lines indicates the absolute error.
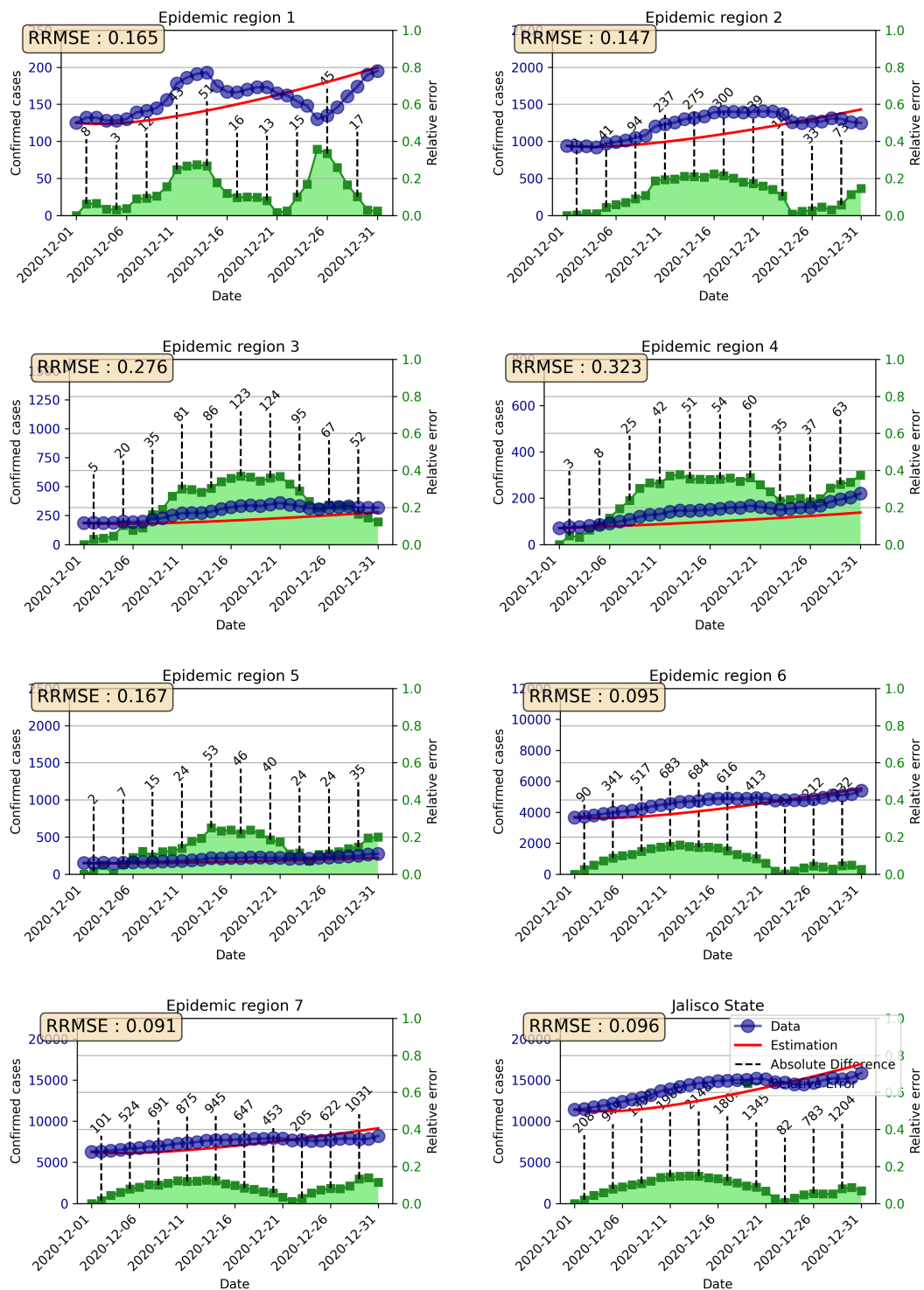
Figure S5. Daily estimating results from December 1, until December 31, 2020. obtained from ERSEIR implementation are presented in red lines, for each epidemic region and for Jalisco state. Active cases data (source [1]) are drawn on blue line with circular marks. Relative error is computed for every day and drawn on green with squared marks and values corresponds to right axis. Numbers over dashed black lines indicates the absolute error.
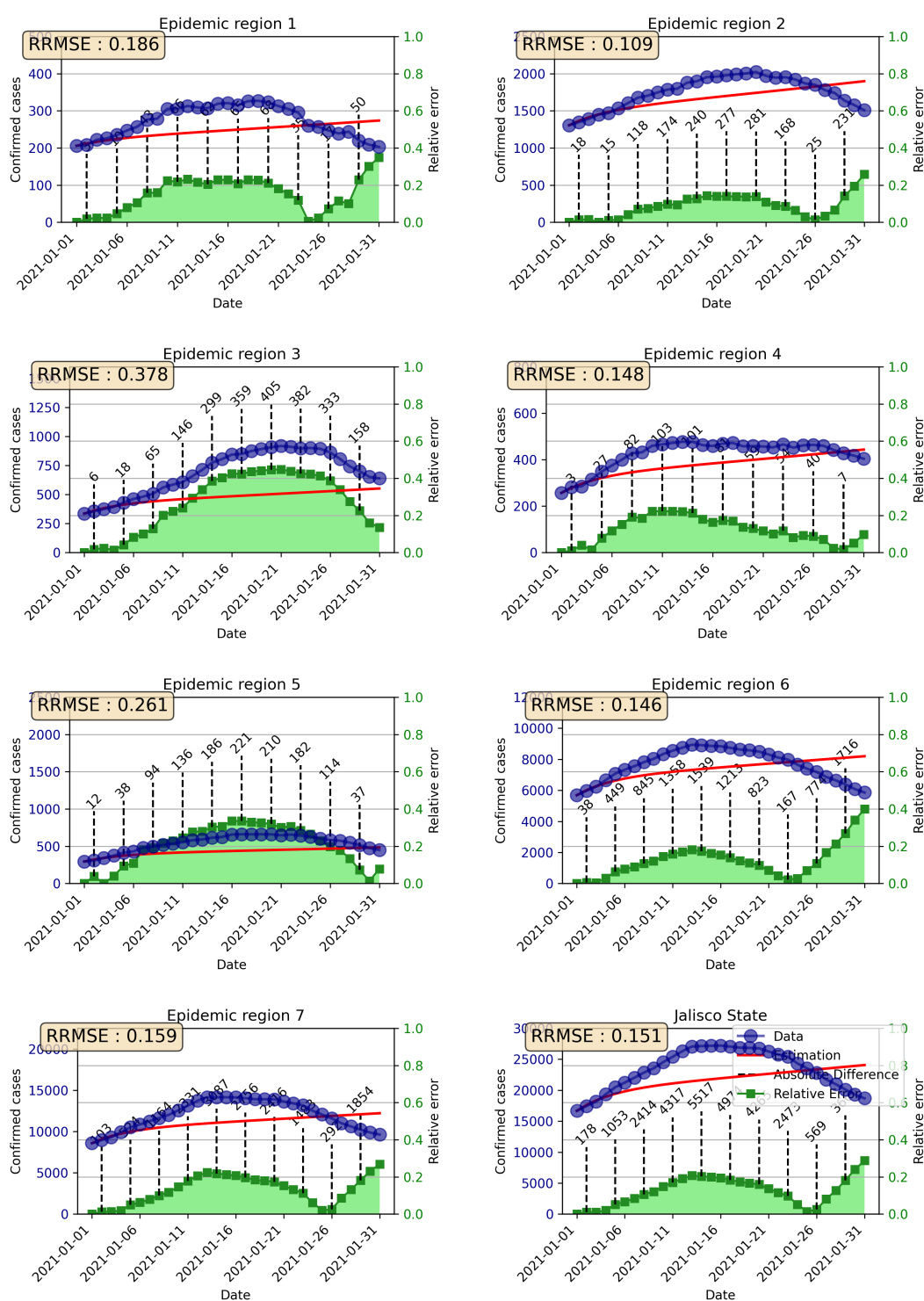
Figure S6. Daily estimating results from January 1, until January 31, 2021. obtained from ERSEIR implementation are presented in red lines, for each epidemic region and for Jalisco state. Active cases data (source [1]) are drawn on blue line with circular marks. Relative error is computed for every day and drawn on green with squared marks and values corresponds to right axis. Numbers over dashed black lines indicates the absolute error.
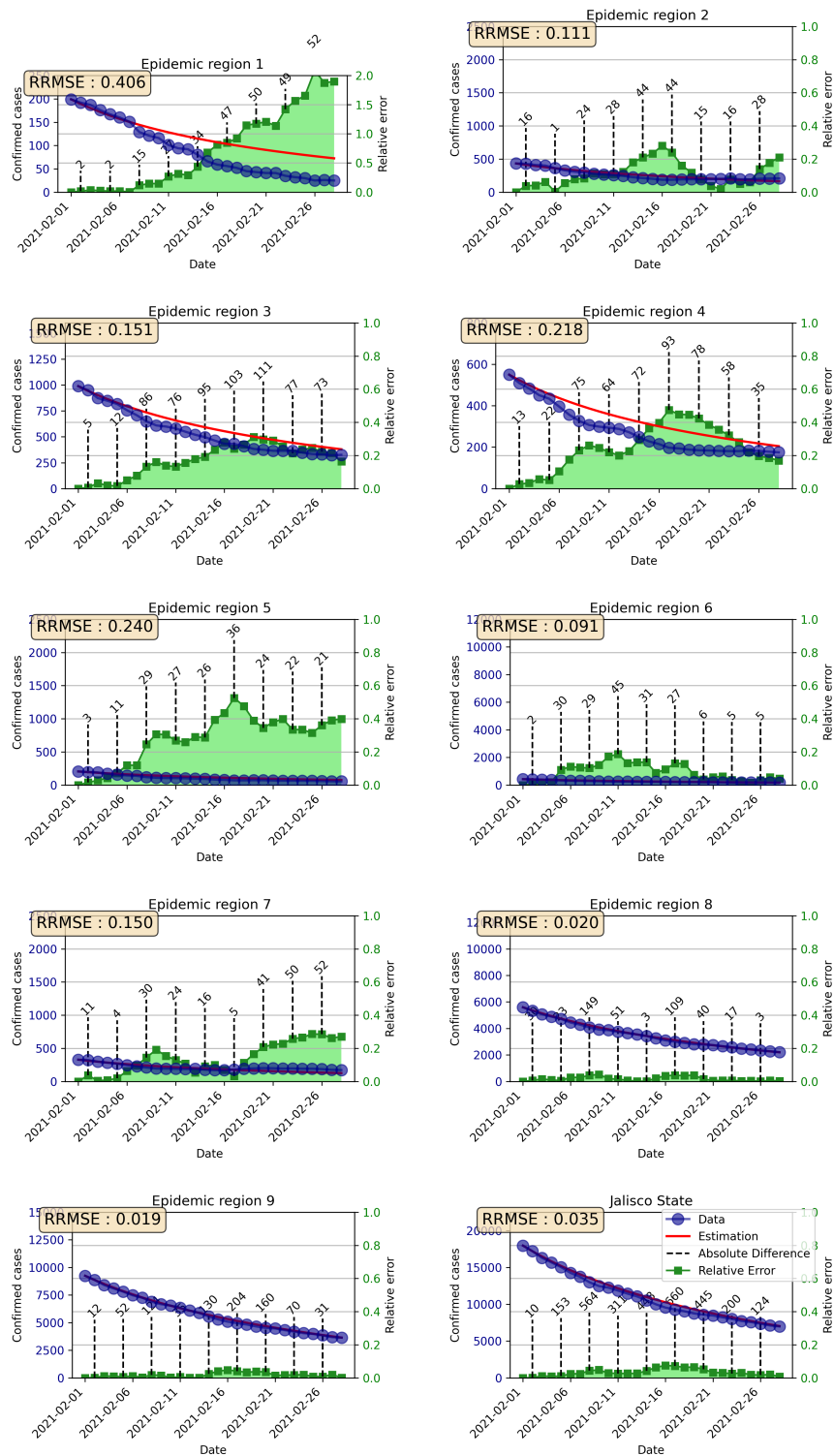
Figure S7. Daily estimating results from February 1, until February 28, 2021. obtained from ERSEIR implementation are presented in red lines, for each epidemic region and for Jalisco state. Active cases data (source [1]) are drawn on blue line with circular marks. Relative error is computed for every day and drawn on green with squared marks and values corresponds to right axis. Numbers over dashed black lines indicates the absolute error.

References

1. Secretaría de Salud Jalisco, Datos de Radar Jalisco, 2021. Available from: https://coronavirus.jalisco.gob.mx/datos-abiertos.

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