Assessment of the object-based indices to identify convective organization

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1 The generated dataset

A dataset of 87696 images is generated by randomly placing circular objects in images with sizes 120x120. The number and size of the circular objects are tuned in order to be in agreement with the TOOCAN dataset. The entire analysis is run using the generated dataset, and the obtained results are shown here. In total, 79996 images have more than one re-
5 constructed object, and they are used to obtain the following results. The code use to generate this dataset is available at https://zenodo.org/record/8287752. In the following, the results obtained with the generated dataset are shown.

Table S1. Correlation of the indices with each other and with the number of convective objects, the total area of convection, and the mean object size. The correlations are obtained using the generated dataset.

	I_{org}	L_{org}	COP	ABCOP	ROME	SCAI	MCAI	MICA	OIDRA	number	total area	mean size
I_{org}	100	76	15	11	-11	-8	-10	12	-1	16	4	-11
L_{org}	76	100	21	10	-5	-13	-14	12	2	23	12	-5
COP	15	21	100	23	81	11	15	71	54	-8	56	81
ABCOP	11	10	23	100	33	-31	-29	-4	28	32	71	32
ROME	-11	-5	81	33	100	9	14	48	53	-10	67	100
SCAI	-8	-13	11	-31	9	100	100	31	15	-99	-40	9
MCAI	-10	-14	15	-29	14	100	100	32	19	-98	-35	14
MICA	12	12	71	-4	48	31	32	100	42	-28	8	47
OIDRA	-1	2	54	28	53	15	19	42	100	-14	48	53
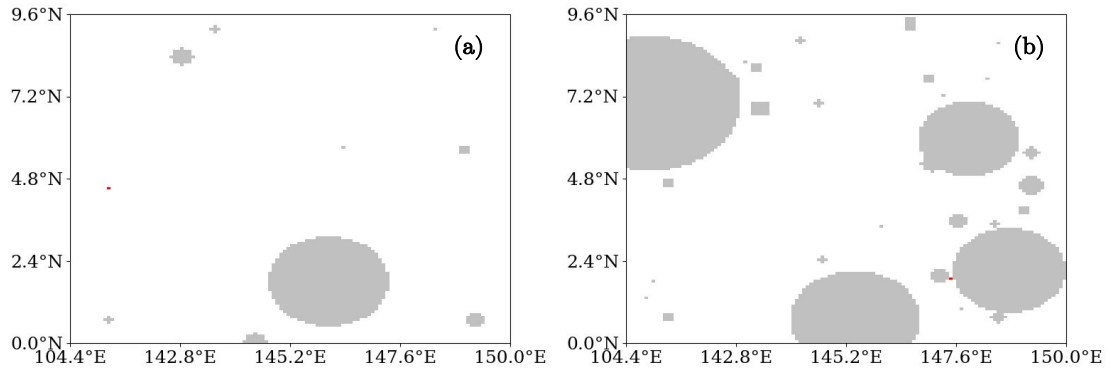
Figure S1. Examples of images produced by the generated datasets. One additional convective grid box in red is added accordingly to (a) perturbation (1) and (b) perturbation (2).

Table S2. Average of the absolute change in percentile $< |\Delta p| >$ after the perturbations of condition (1) and condition (2). The values are obtained using the generated dataset.

	I_{org}	L_{org}	SCAI	MCAI	COP	ABCOP	ROME	MICA	OIDRA	number	total area
condition (1)	12.2	10.2	3.8	4.1	5.0	1.2	1.9	3.4	0.7	3.7	0.1
condition (2)	12.2	7.7	2.6	2.9	2.4	5.1	1.7	0.0	0.6	3.1	0.0
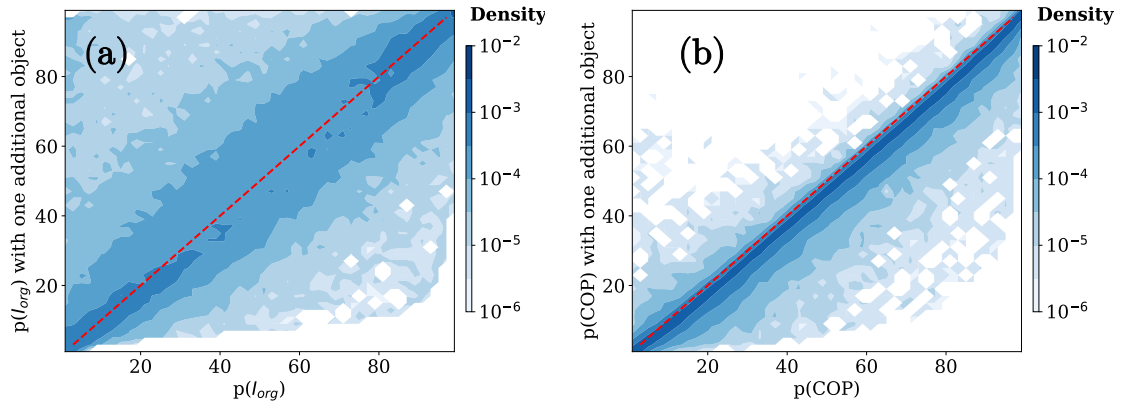
Figure S2. Bidimensional distribution of $p(I_{org})$ (e) and $p(\text{COP})$ (f) of the reference and the perturbed dataset. The figure is obtained using the generated dataset.
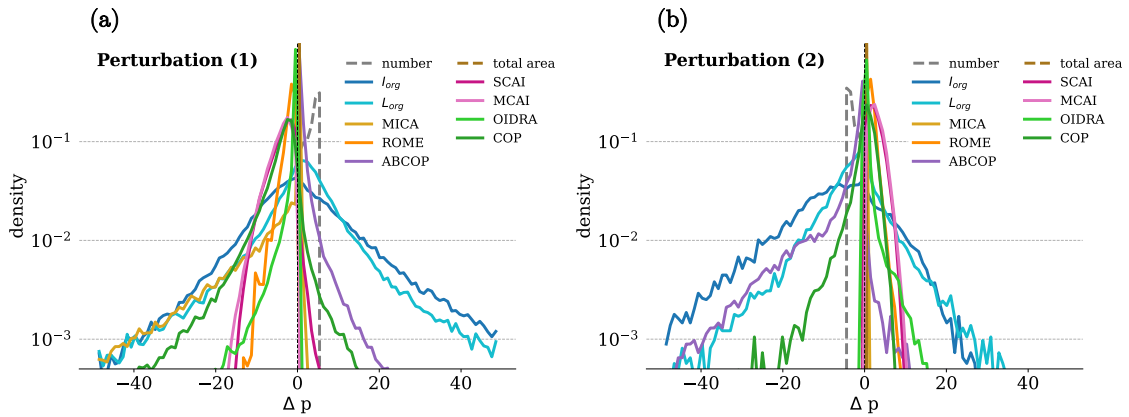
Figure S3. Distribution of Δp for all the indices (a) for condition (1), and (b) for condition (2). The figure is obtained using the generated dataset.
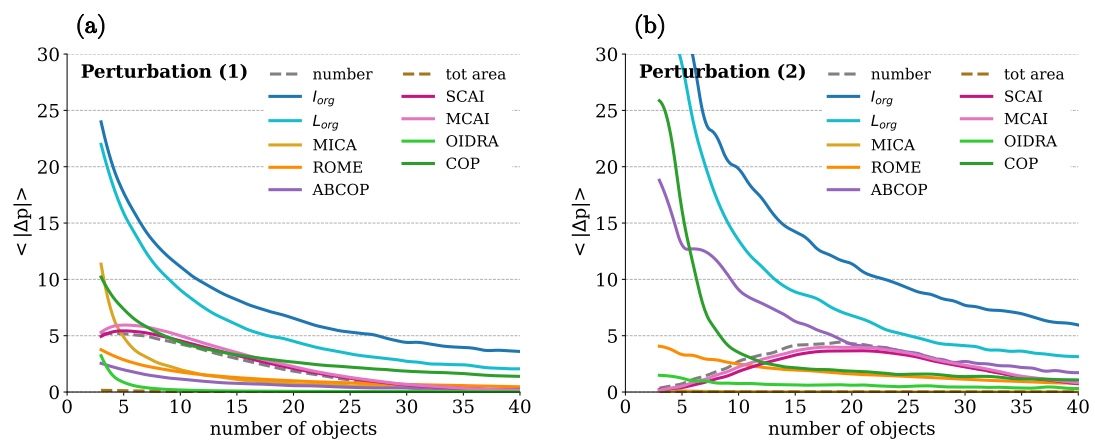
Figure S4. Senstivity of each index as a function of the number of objects of the dataset. Perturbation (1) is shown in (a) and perturbation (2) is shown in (b). The figure is obtained using the generated dataset.
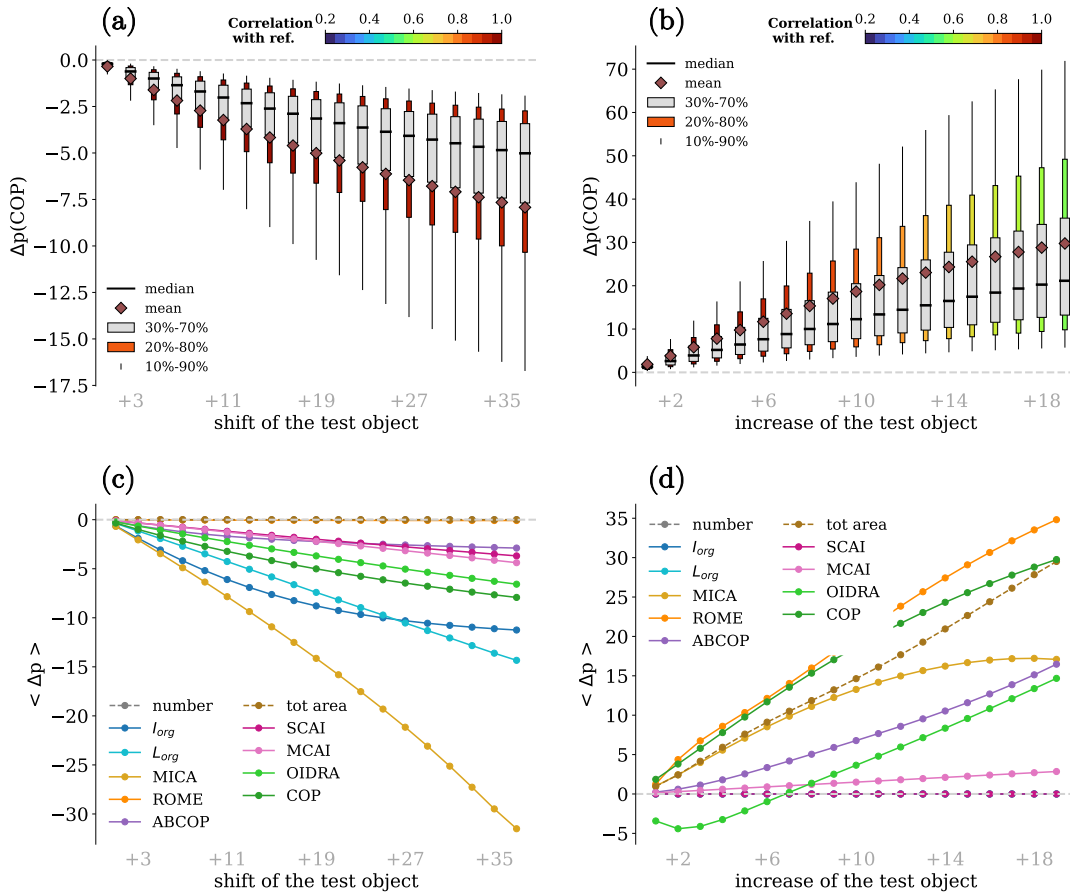
Figure S5. Distribution of $\Delta p(\mathrm{COP})$ as a function of the perturbation (3) in (a), and perturbation (4) in (b). The grey boxes indicate the percentile ranges from 30% to 70%, the colored boxes indicate the percentile 20% and 80% and the colors display the correlation between the reference and the modified dataset. The whiskers cover from 10% to 90% of the distributions. The means and the medians of $\Delta p(\mathrm{COP})$ are shown by the rhombuses and the black lines respectively. The means of Δp are displayed for all the indices as a function of the perturbations of condition (3) in (c), and condition (4) in (d). The figure is obtained using the generated dataset.
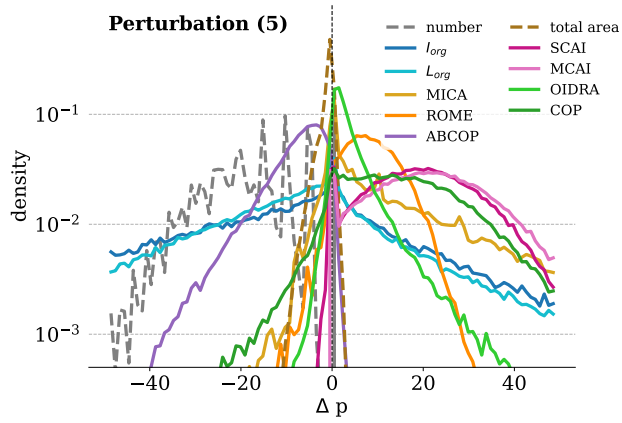
Figure S6. Distribution of Δp for all the indices after down-scaling the resolution of a factor of 3. The figure is obtained using the generated dataset.
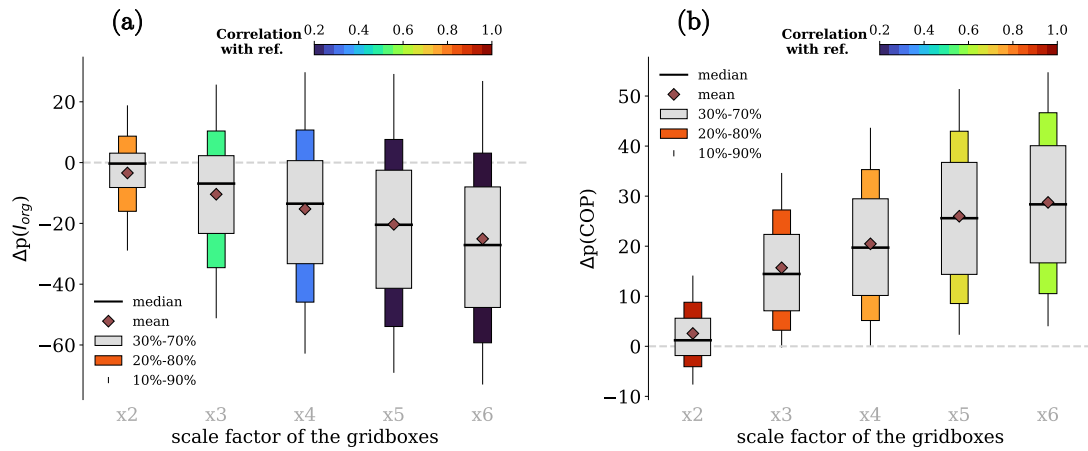
Figure S7. Distribution of $\Delta p(I_{org})$ (a) and $\Delta p(COP)$ (b) as a function of the resolution scale factor. The figure is obtained using the generated dataset.
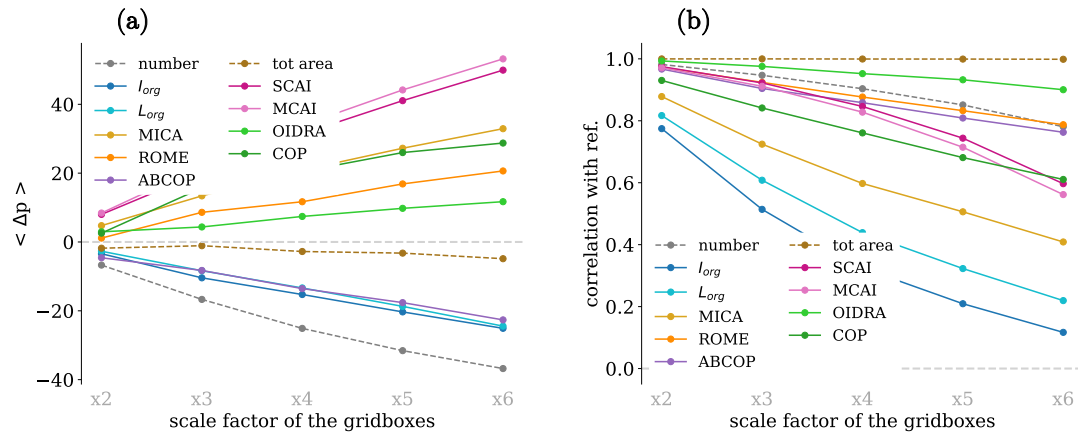
Figure S8. Distribution of Δp for all the indices for condition (5) under a change in resolution of a factor of 3. The figure is obtained using the generated dataset.
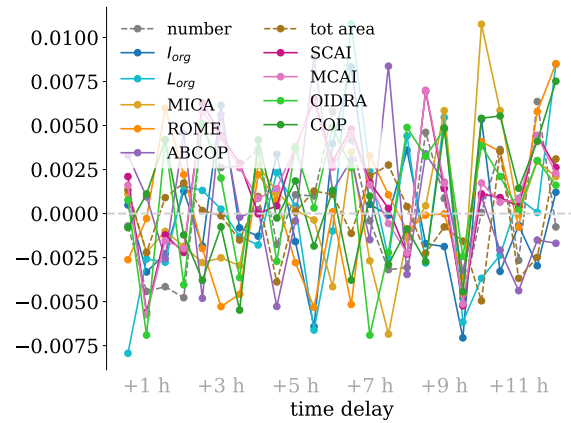
Figure S9. Autocorrelation of each index between 30 minutes and 12 hours. The figure is obtained using the generated dataset.
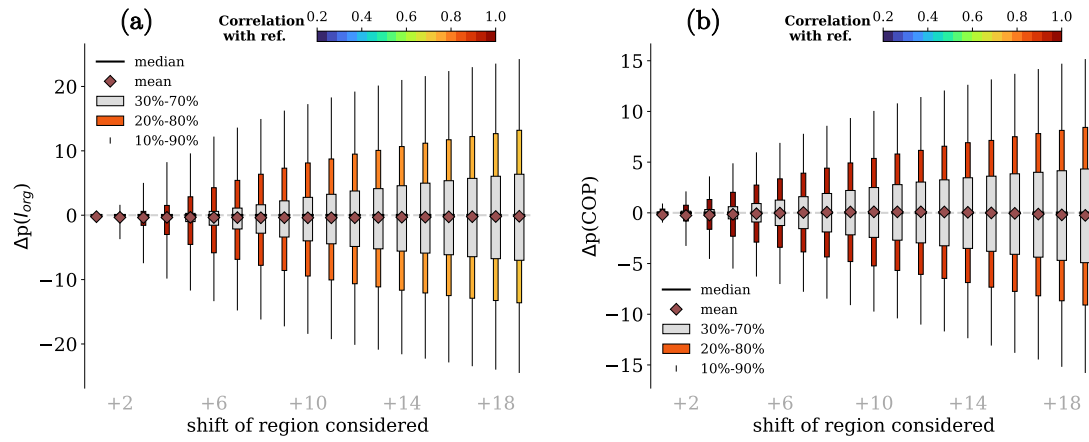
Figure S10. Distribution of $\Delta p(I_{org})$ (a) and Δp(COP) (b) as a function of the perturbations of condition (7). The figure is obtained using the generated dataset.
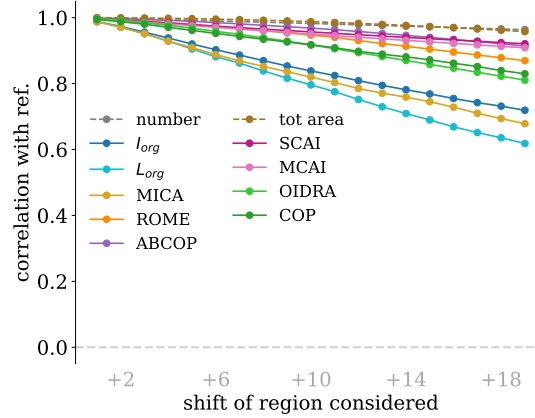
Figure S11. Correlation of each index between the reference and the modified datasets as a function of the domain shift. The figure is obtained using the generated dataset.