

Supplementary material.

EarthNet2021: A large-scale dataset and challenge for Earth surface forecasting as a guided video prediction task.

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1. Supplementary material

Arcon visualizations Median scoring sample according to ENS over the IID test set with all guiding variables can be seen in Fig. 9.

Extra baseline results Extreme and Seasonal test set results for the tested models can be seen in table 3.

Similar datasets Table 2 contains information on datasets similar to EarthNet2021.

Dataset information Table 4 contains information about the variables used in EarthNet2021. Table 5 contains information about the packaging of minicubes into files.

Dataset	Task	Samples	Size(GB)
<i>Satellite imagery</i>			
SpaceNet7 [10]	Building footprint det.	2.4k	56
AgriVision [2]	Field anomaly det.	21k	4
xBD [5]	Building damage det.	22k	51
DynamicEarthNet[11]	Land cover change det.	75*300	63
BigEarthNet [9]	Land use classification	590k	121
<i>Video prediction</i>			
Cityscapes [3]	Video annotation	25k	56
Traffic4cast [6]	Traffic forecasting	474	23
UCF101 [8]	Human actions	13k	7
EarthNet2021	Earth surface forecasting	32k*30	218

Table 2. Large-scale deep-learning-ready datasets.

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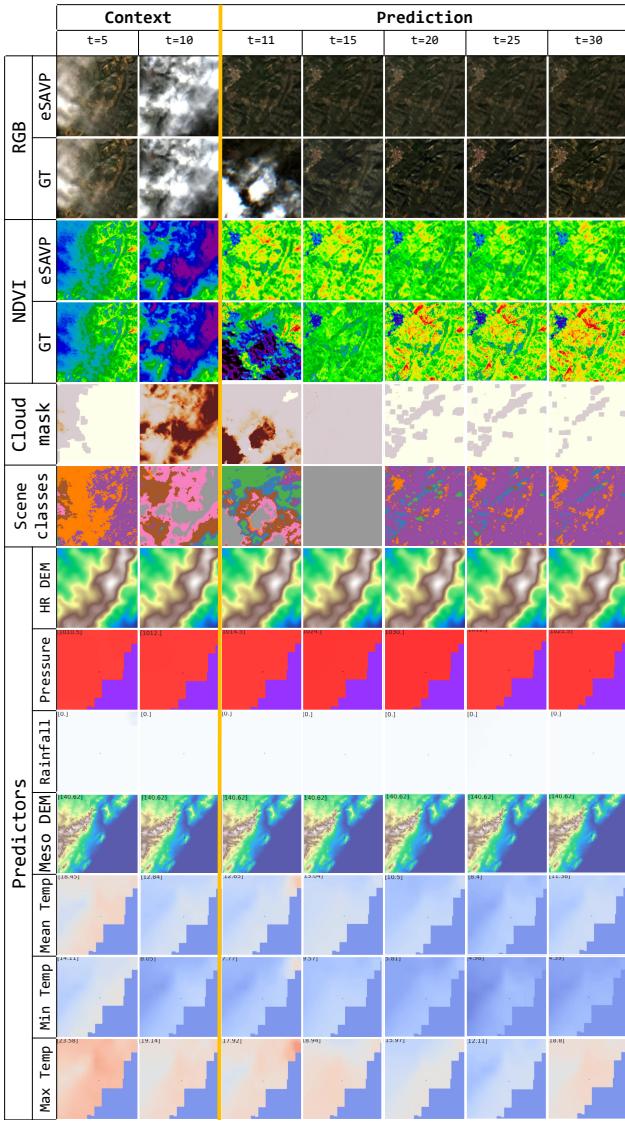


Figure 9. Median sample predicted by the extended SAVP model (Arcon) according to EarthNetScore over the full IID set. Predictions of Arcon on "eSAVP" rows, ground truth on "GT" rows. Yellow line marks the beginning of the predicted frames. Predictors and auxiliary layers are plotted directly from the minicube file.

	Extreme					Seasonal				
	ENS	MAD	OLS	EMD	SSIM	ENS	MAD	OLS	EMD	SSIM
Persistence	0.1939	0.2158	0.2806	0.1614	0.1605	0.2676	0.2329	0.3848	0.2034	0.3184
Channel-U-Net	0.2364	0.2286	0.2973	0.2065	0.2306	0.1955	0.2169	0.3811	0.1903	0.1255
Arcon	0.2215	0.2243	0.2753	0.1975	0.2084	0.1587	0.2014	0.3788	0.1787	0.0834

Table 3. Models performance on EarthNet2021 over the extreme and seasonal test sets

Variable	Description	Source	Rescaling	Unit
b	490nm reflectance	Sentinel-2 MSI L2A[7]	None	TOA [0,1]
g	560nm reflectance	Sentinel-2 MSI L2A[7]	None	TOA [0,1]
r	665nm reflectance	Sentinel-2 MSI L2A[7]	None	TOA [0,1]
nif	842nm reflectance	Sentinel-2 MSI L2A[7]	None	TOA [0,1]
cld	Cloud probability	Sentinel-2 Product[7]	None	%
scl	Scene classification	Sentinel-2 Product[7]	None	categorical
cldmask	Cloud mask	EarthNet pipeline	None	binary
elevation	Digital elevation model	EU-DEM[1]	$2000 \cdot (2 \cdot \text{elevation} - 1)$	meters
rr	Rainfall	E-OBS[4]	$50 \cdot rr$	mm/d
pp	Pressure	E-OBS[4]	$900 + 200 \cdot pp$	mbar
tg	Mean temperature	E-OBS[4]	$50 \cdot (2 \cdot tg - 1)$	celcius
tn	Minimum temperature	E-OBS[4]	$50 \cdot (2 \cdot tg - 1)$	celcius
tm	Maximum temperature	E-OBS[4]	$50 \cdot (2 \cdot tg - 1)$	celcius

Table 4. Variables included in EarthNet2021.

Array name	Shape	Spatial (res)	Temporal (res)	Variables
highresdynamic	[128,128,7, t_{hr}]	[128,128] (20m)	(30,60,210) (5-daily)	[b,g,r,nif,cld,scl,cldmsk]
mesodynamic	[80,80,5, t_{meso}]	[80,80] (1.28km)	(150,300,150) (daily)	[rr,pp,tg,tn,tx]
highresstatic	[128,128]	[128,128] (20m)	[1] (fixed)	elevation
mesostatic	[80,80]	[80,80] (1.28km)	[1] (fixed)	elevation

Table 5. Content on each compressed 'sample.npz' minicube files.

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