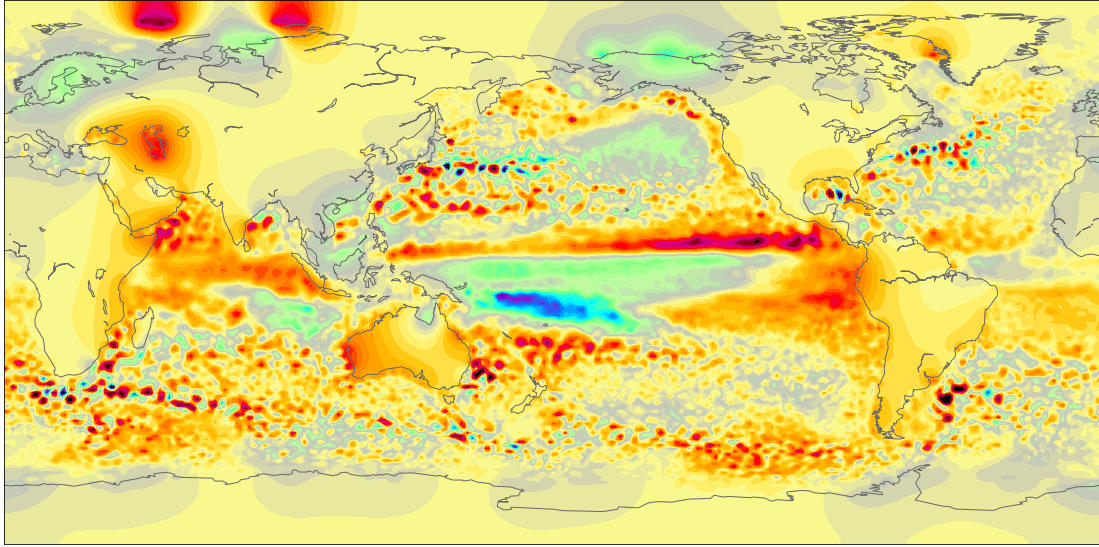
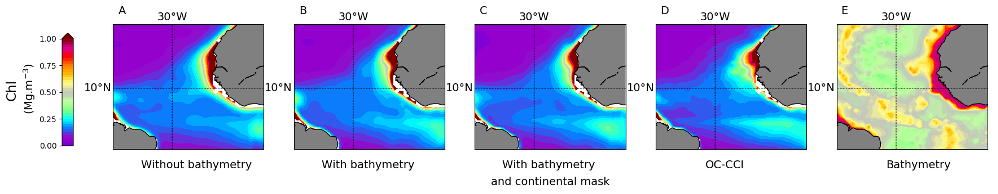
Supplementary Material

# Supplementary Figures and Tables

## Supplementary Figures



**Supplementary Figure 1.** SLA after Gap-filling using the heat diffusion equation on land.

**

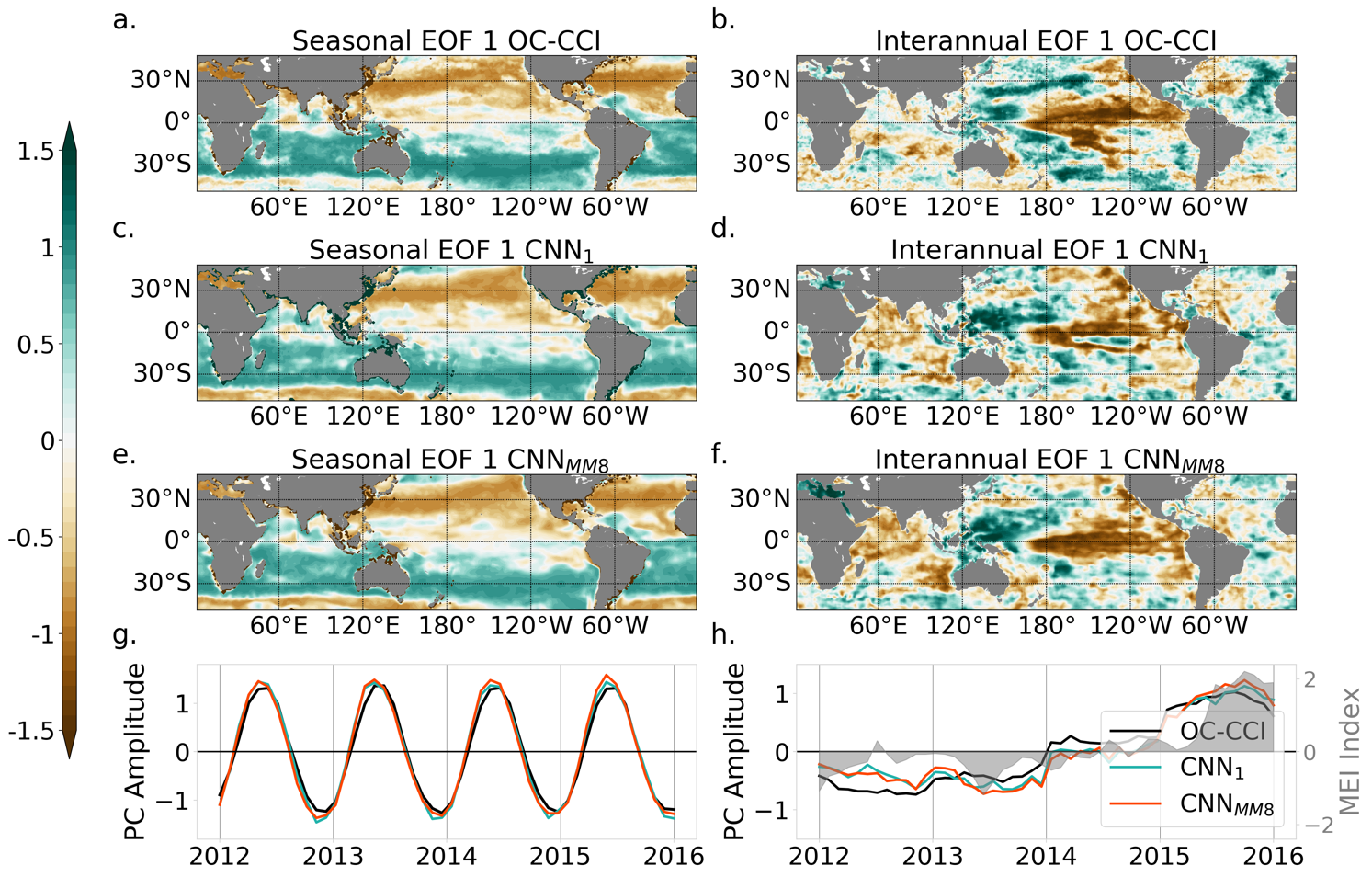
**Supplementary Figure 2.** Reconstructed Chl averaged over [2012-2015] A) without bathymetry, B) with bathymetry, C) with both bathymetry and binary continental mask, D) satellite ChlOC-CCI averaged over the same time-period, E) bathymetry.



**Supplementary Figure 3.** Learning curves of left) CNN1 and right) CNNMM8.



**Supplementary Figure 4.** a) correlation and b) NRMSE between ChlOC-CCI and reconstructed Chl from CNN1 over [2012-2015]



**Supplementary Figure 5.** EOFs first modes of seasonal (a) ChlOC-CCI (33.2% of the total variance), (c) ChlCNN1 (39.6% of the total variance), (e) ChlCNN-MM8 (40.29% of the total variance), and (g) their associated PCs over [2012-2015]. In the same manner, EOFs first modes of interannual (b) ChlOC-CCI (13.21% of the total variance), (d) ChlCNN1 (12.04% of the total variance), (f) ChlCNN-MM8 (13.75% of the total variance), and (h) their associated PCs over [2012-2015]. In (h), the MEI is reported as the grey shaded area.

## Supplementary Tables

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  | **Global Scatterplot** | | |
| **Layers of CNN** | **Tested hyperparameter** |  | *R*2 | RMSE | Slope |
| Convolutional layers 3x3: 12\*16\*32 | |  |  |  |  |
|  | Batch\_Size  (without Batch Norm) | 2 | 0.81 | 0.33 | 0.87 |
|  |  | 20 | 0.81 | 0.33 | 0.87 |
|  | Batch Norm | Yes, Batch\_size = 20 | 0.79 | 0.34 | 0.87 |
|  |  | No | 0.81 | 0.33 | 0.87 |
|  | Kernel Size | 1x1 | 0.71 | 0.40 | 0.68 |
|  |  | 3x3 | 0.81 | 0.33 | 0.87 |
|  |  | 5x5 | 0.82 | 0.31 | 0.88 |
|  | Number of conv 3x3 layers | 12\*16\*32 | 0.81 | 0.33 | 0.87 |
|  |  | 12\*16\*32\*64 | 0.84 | 0.30 | 0.90 |
|  |  | 12\*16\*32\*64\*128 | 0.86 | 0.28 | 0.91 |
| Convolutional layers 3x3: 12\*16\*32\*64\*128 (CNN1) | |  |  |  |  |
|  | Learning rate | 0.1 | 0 | 0 | 0 |
|  |  | 0.01 | 0.76 | 0.37 | 0.81 |
|  |  | 0.001 | 0.83 | 0.32 | 0.93 |
|  |  | 0.0001 | 0.83 | 0.33 | 0.96 |
|  |  | 0.00001 | 0.77 | 0.37 | 0.90 |
|  |  | 0.001 -> 0.0001 | 0.83 | 0.31 | 0.89 |
|  | Dropout | 0.15 | 0.83 | 0.33 | 0.96 |
|  |  | 0.35 | 0.82 | 0.33 | 0.93 |
|  |  | 0.50 | 0.81 | 0.34 | 0.91 |

**Supplementary Table 1.** Global performance metrics obtained over [1998-2001] with the CNN1 according to different hyperparameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Global Scatterplot** | | | **Corr. Seas. PC** | **Corr. Inter. PC** | **N param** |
| **Model** | *R*2 | RMSE | Slope |  |  |  |
| CNNMM1 | 0.81 | 0.32 | 0.84 | 0.99 | 0.84 | 25 025 |
| CNNMM2 | 0.84 | 0.30 | 0.89 | 0.99 | 0.87 | 58 134 |
| CNNMM3 | 0.85 | 0.29 | 0.92 | 0.99 | 0.89 | 83 339 |
| CNNMM4 | 0.87 | 0.27 | 0.91 | 0.99 | 0.94 | 108 364 |
| CNNMM6 | 0.87 | 0.27 | 0.89 | 0.99 | 0.92 | 157 836 |
| CNNMM8 | 0.87 | 0.26 | 0.89 | 0.99 | 0.92 | 208 464 |
| CNNMM10 | 0.87 | 0.26 | 0.91 | 0.99 | 0.93 | 259 092 |
| CNNMM15 | 0.87 | 0.27 | 0.93 | 1.00 | 0.92 | 383 639 |

**Supplementary Table 2.** Global performance metrics obtained over [1998-2001] with the CNNMMi according to the number of modes