The available images for 2014 (Figure 36) show an increase from May to the highest values in August. Higher values are detected in the northern and western parts of the lagoon (2.5-5.0 μg/l) and lower at the southern parts (1.0-1.8 μg/l). In the following months, Chl-a values decreased until the end of the year.

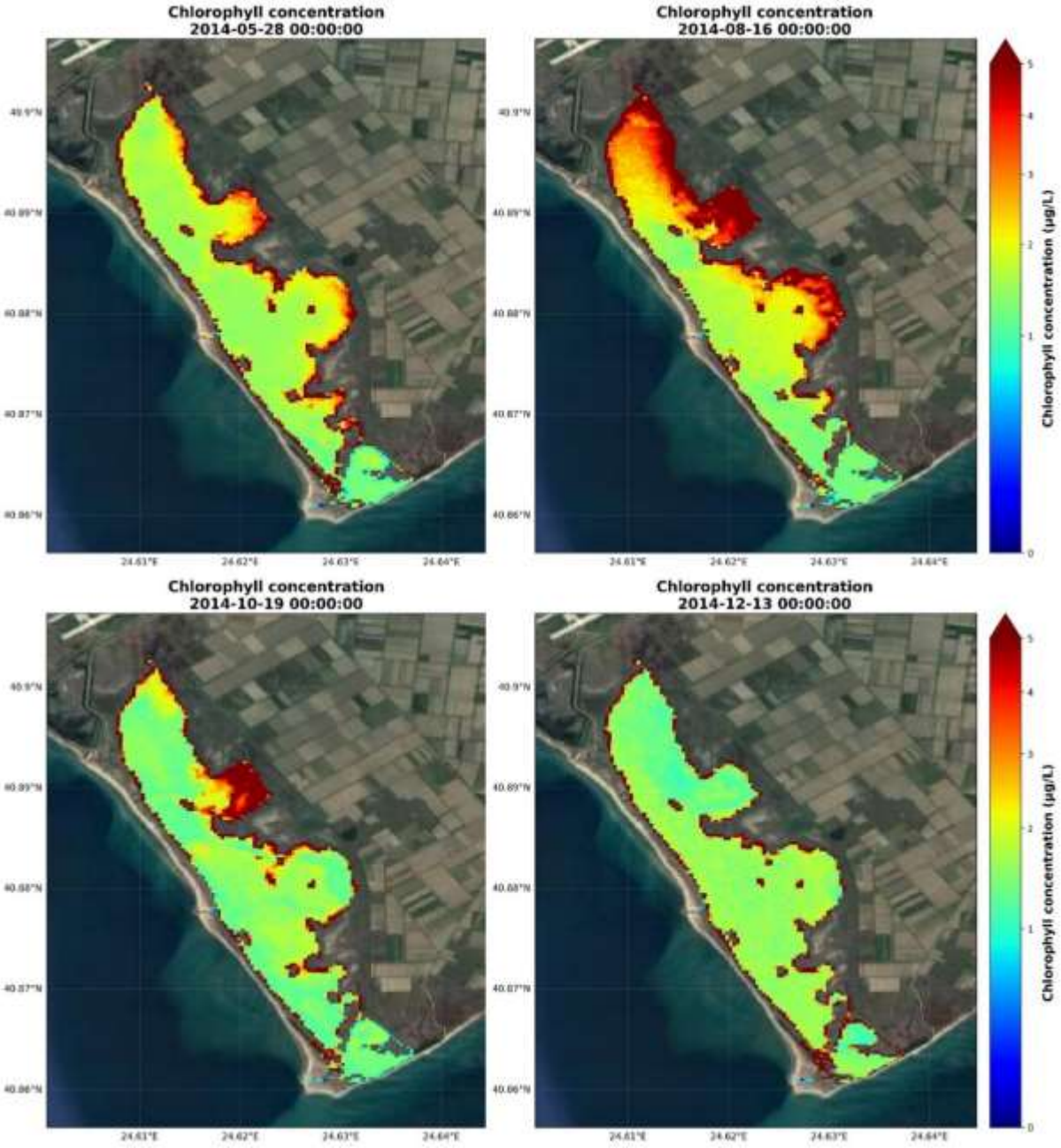

Figure 36. Seasonal evolution of Chl-a concentration in Agiasma lagoon for the year 2014, based on Landsat 8 satellite images.

The first half of 2015 is presented in Figure 37 covered by Landsat 8 and the second half is presented in Figure 38 covered by Sentinel 2. During the first half of the year, Chl-a values

decrease from January to February and then started increasing again until late May. In May the south-eastern parts of the lagoon shows lower concentrations (1.2 μg/l), compared to the rest of the basin (2.0-5.0 μg/l)

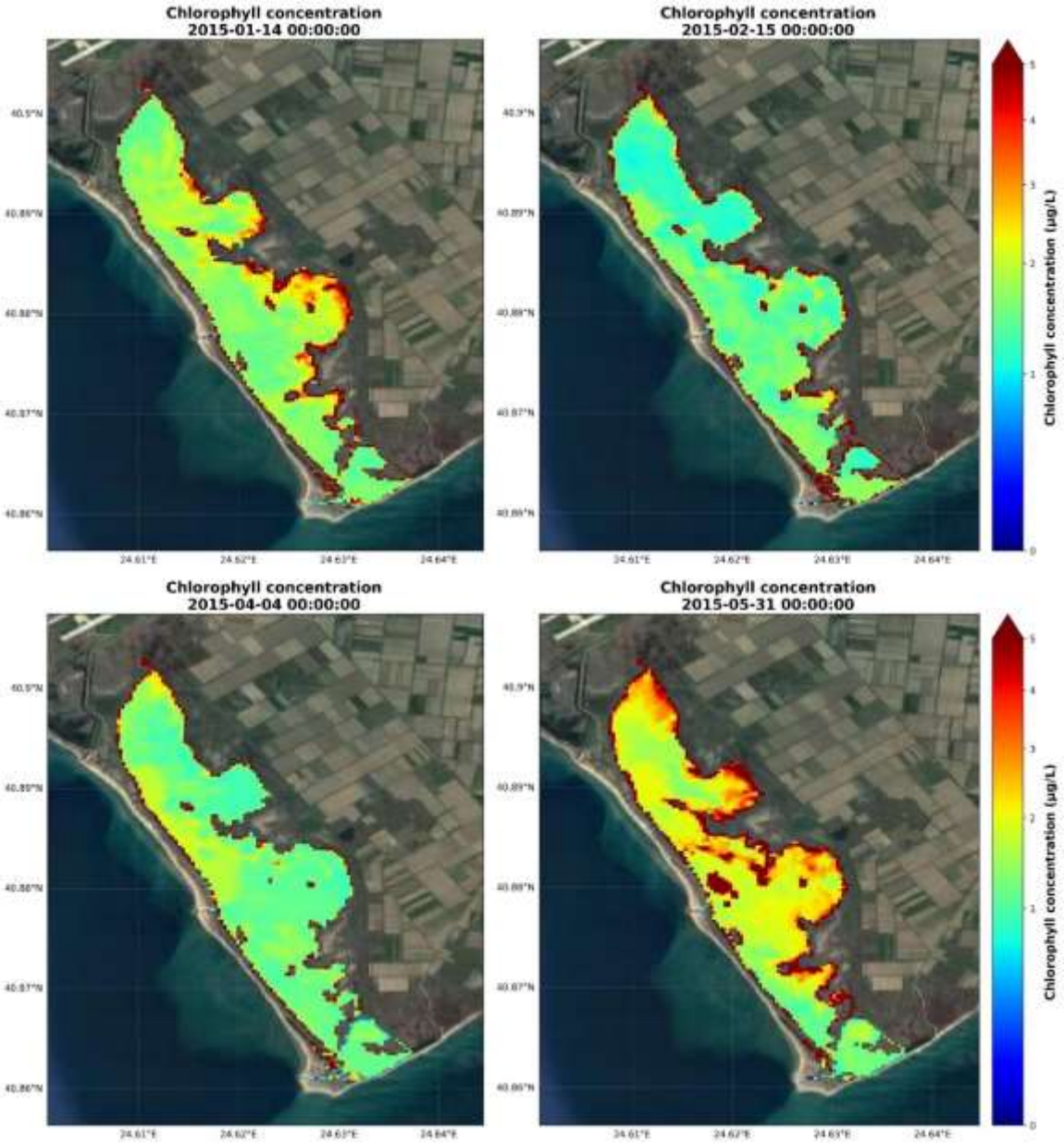

Figure 37. Seasonal evolution of Chl-a concentration in Agiasma lagoon for the year 2015, based on Landsat 8 satellite images.

For the second half of 2015 (Figure 38), higher Chl-a values are observed during the summer. At the end of the summer, Chl-a deceased until the end of the year, with the exception of the northern part, which seems to retain higher values compared to the rest of the basin (3.5 μg/l).

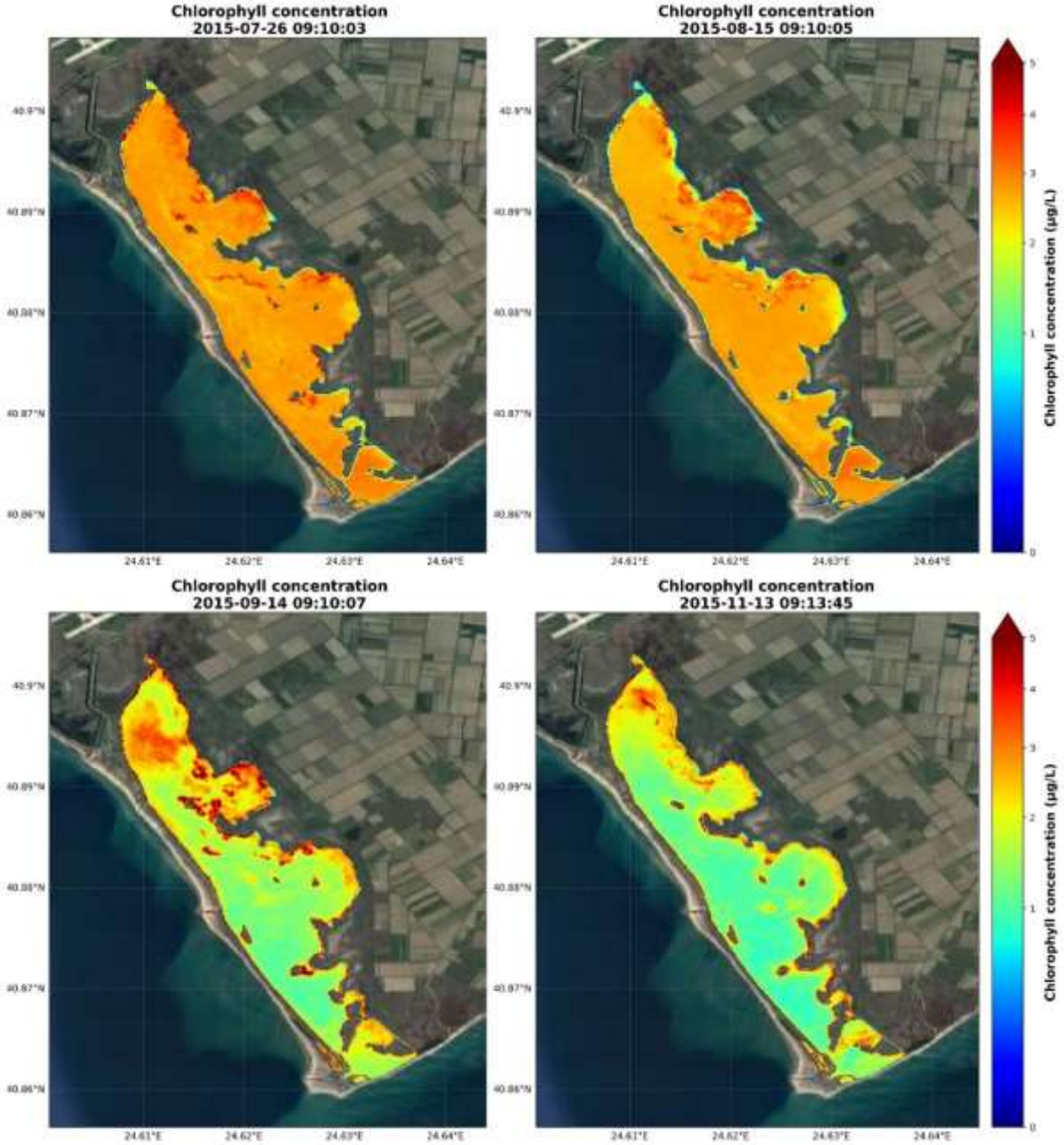

Figure 38. Seasonal evolution of Chl-a concentration in Agiasma lagoon for the year 2015, based on Sentinel 2 satellite images.

The same pattern in Chl-a evolution is observed in 2016 (Figure 39), where higher values are observed in the summer months and then decrease as we move towards autumn and winter. Higher values at the northern part in the autumn and winter months are also observed in 2016.

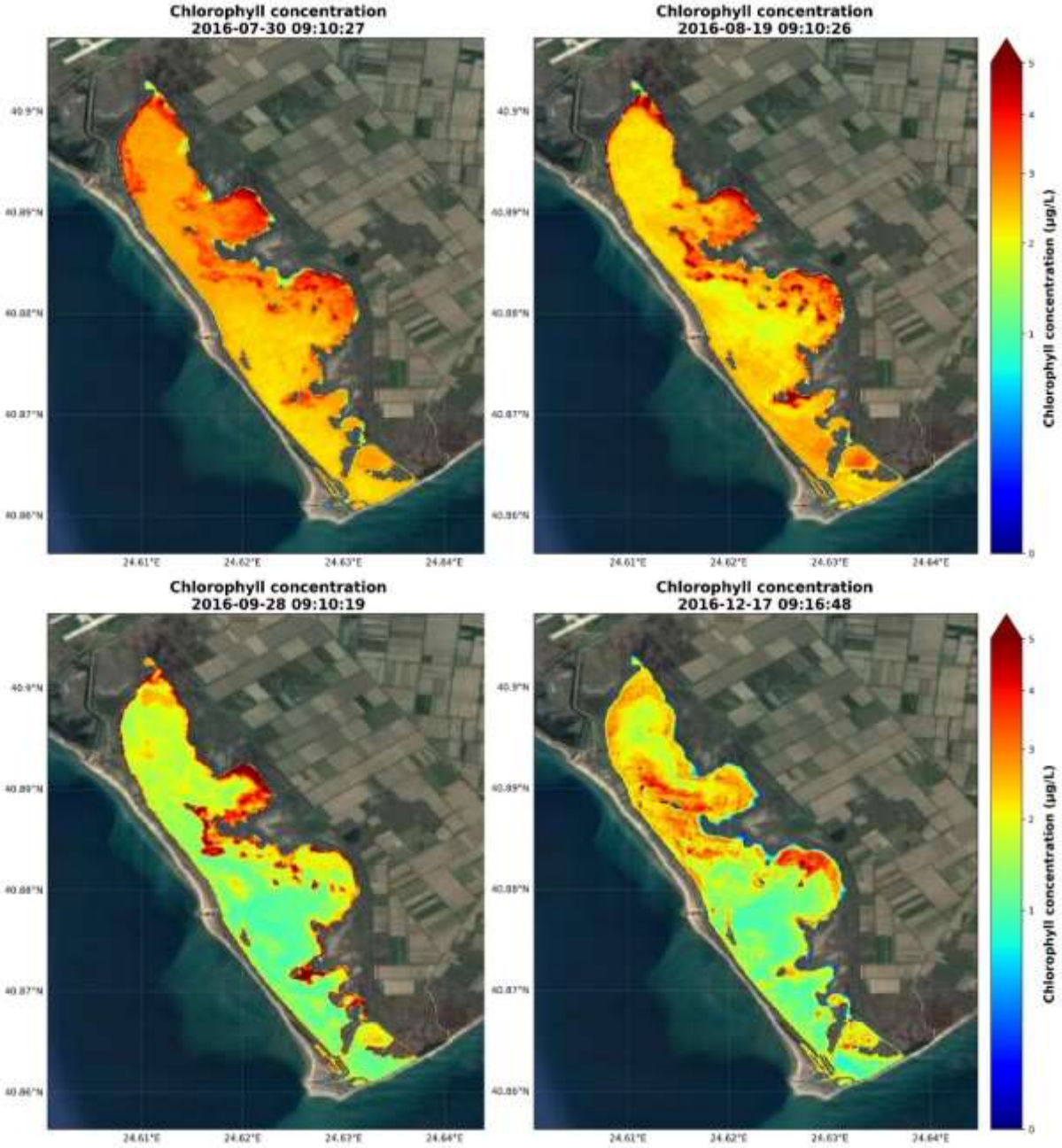

Figure 39. Seasonal evolution of Chl-a concentration in Agiasma lagoon for the year 2016, based on Sentinel 2 satellite images.

At the beginning of 2017, higher Chl-a values at the upper part of the lagoon are detected in February. There is a decreasing trend as we move towards April. Chl-a values increase in the whole basin in late June. In the following months, a decrease is detected, except for the northern part of the lagoon, which seems to retain high values compared to the rest of the basin.

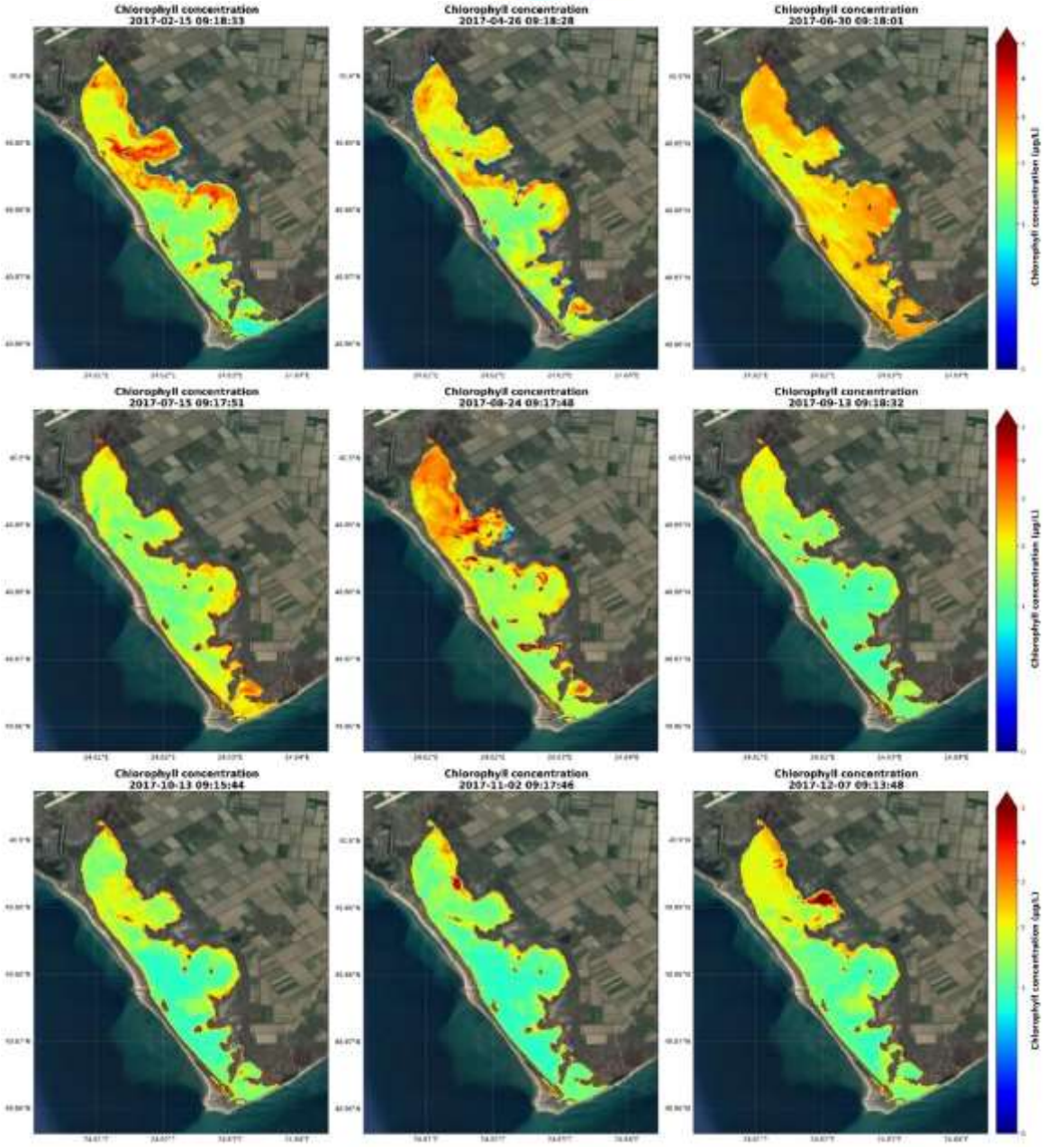

Figure 40. Seasonal evolution of Chl-a concentration in Agiasma lagoon for the year 2017, based on Sentinel 2 satellite images.

Figure 41 show an increase in Chl-a values, from low concentrations in January to higher in May (2.5-3.0 μg/l), starting from the northern parts (late April) and then spreading to the rest of the basin. In the following months, Chl-a decreases until July and then increases again and remains high until the mid of September. Another peak is observed in November.

In 2019 (Figure 42), higher Chl-a values are observed in January compared to previous years (up to 4.5 μg/l). Then there is an increase from February until May, starting from the north-western parts and expanding to the rest basin. After a decrease in the following

months, the highest values are observed in late summer. Then a decrease starting from the southern part of the lagoon is observed and in November the autumn maximum is reached.

In 2020 (Figure 43), the first increase in Chl-a values is observed in March, with the north-western parts showing higher values (2.0-4.0 μg/l) than the rest of the lagoon. In the following months, Chl-a evolution follows the same pattern as in 2019.

During 2021 (Figure 44), a maximum in Chl-a values is reached in May, with the higher values localized at the northern and central parts of the lagoon. In the following months, a decrease is observed and the Chl-a distributes more uniformly across the basin. A peak is observed at the beginning of October. A decrease is observed from late October starting from the southern part and spreading to the center of the lagoon.

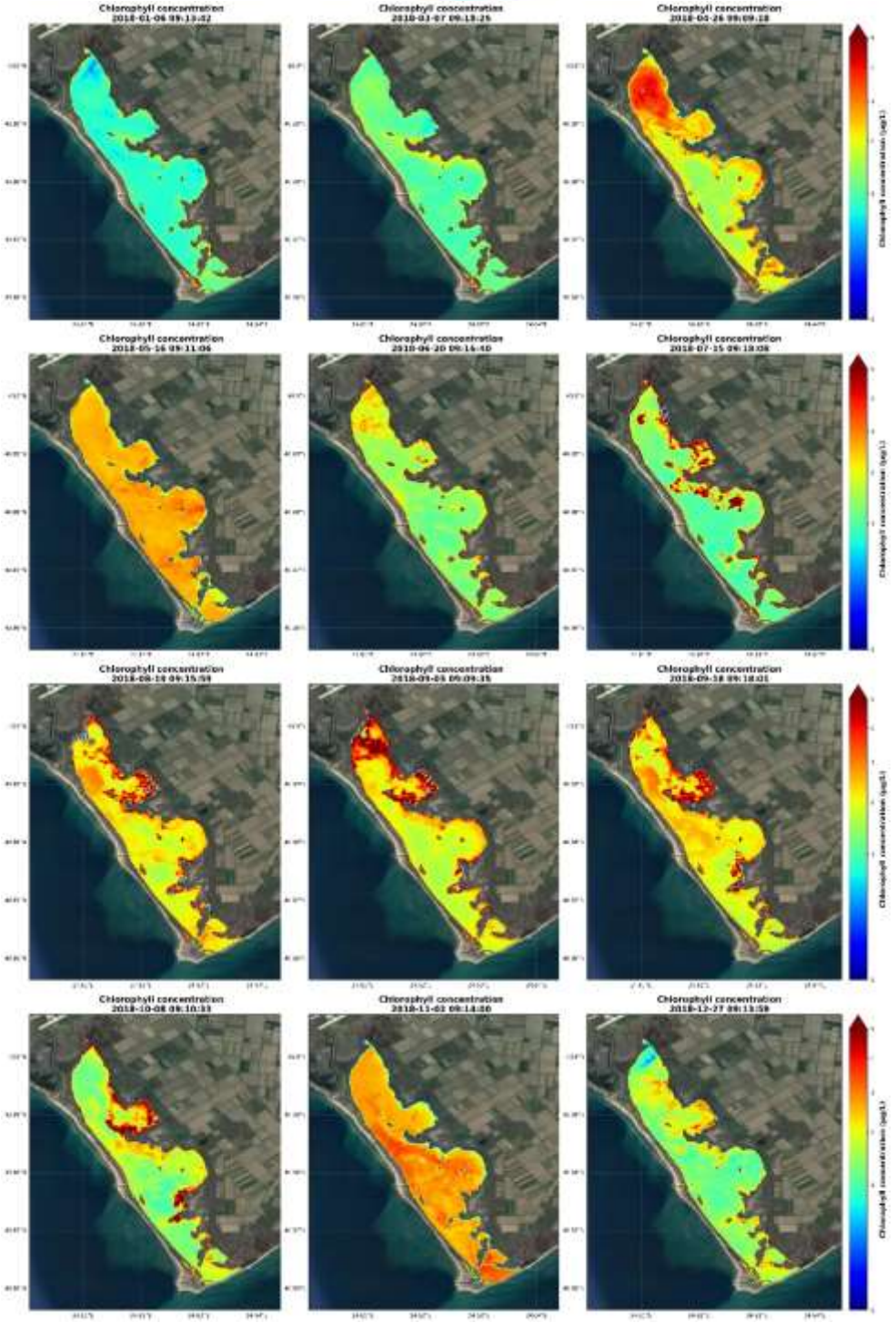

Figure 41. Seasonal evolution of Chl-a concentration in Agiasma lagoon for the year 2018, based on Sentinel 2 satellite images.

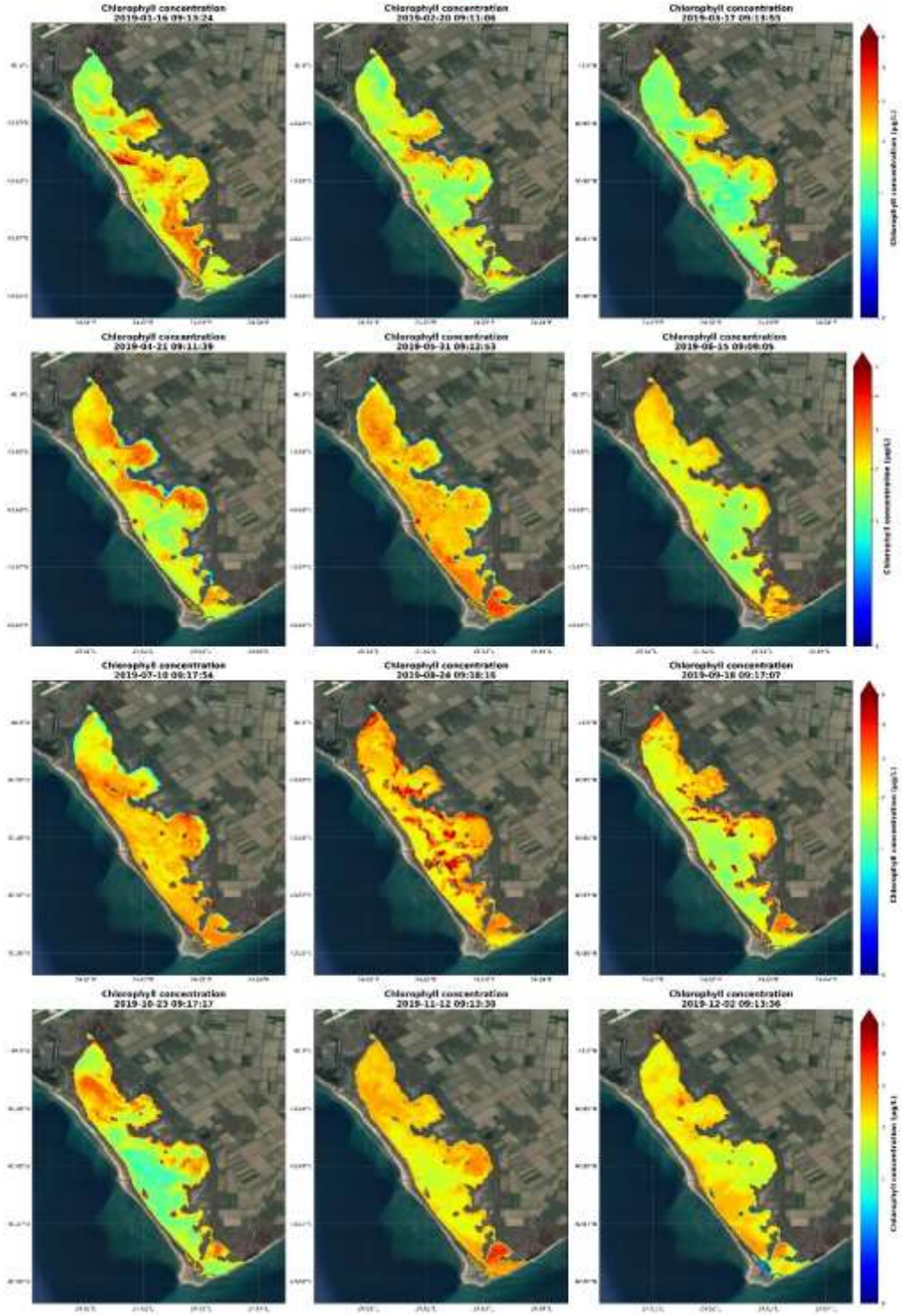

Figure 42. Seasonal evolution of Chl-a concentration in Agiasma lagoon for the year 2019, based on Sentinel 2 satellite images.

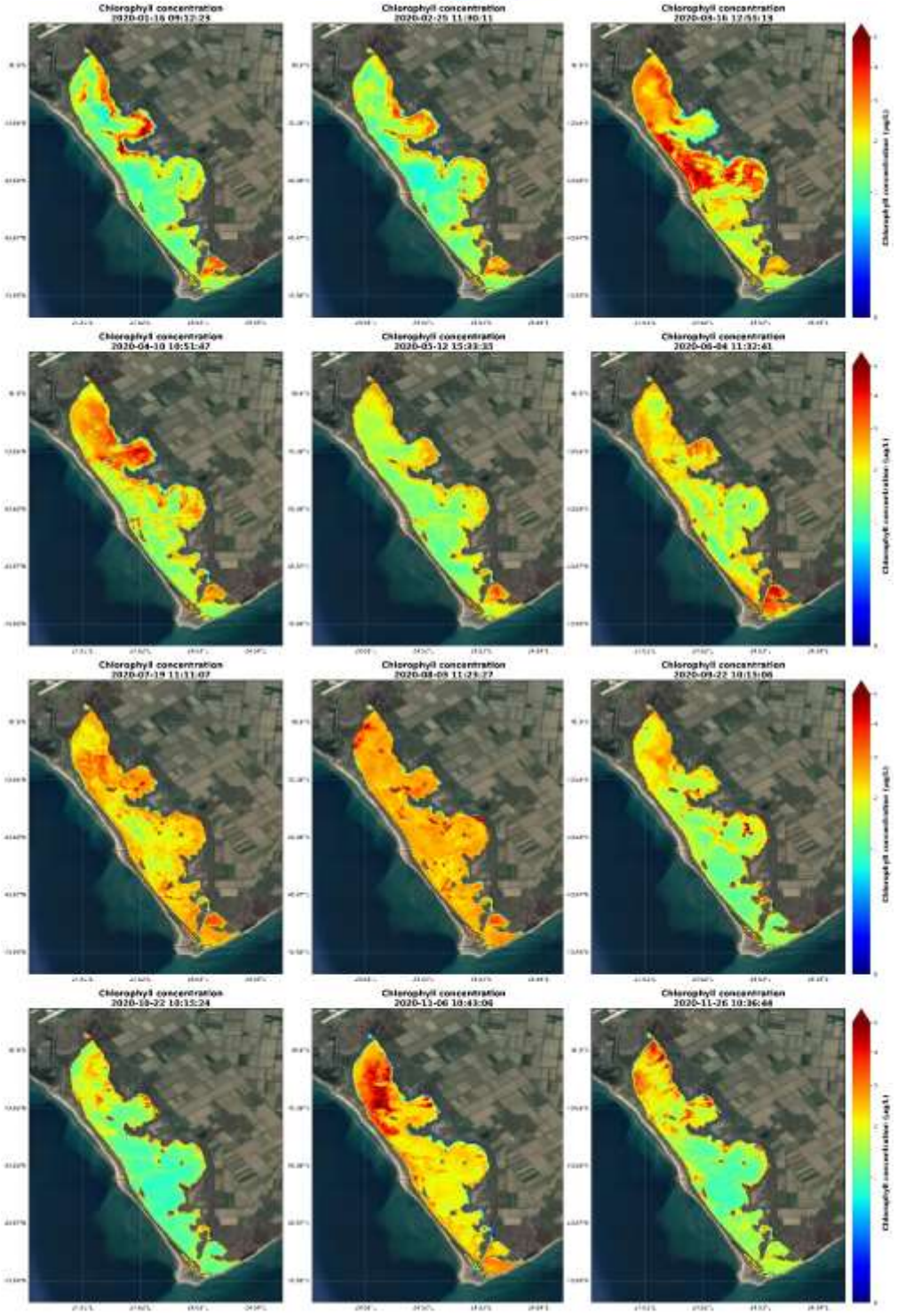

Figure 43. Seasonal evolution of Chl-a concentration in Agiasma lagoon for the year 2020, based on Sentinel 2 satellite images.

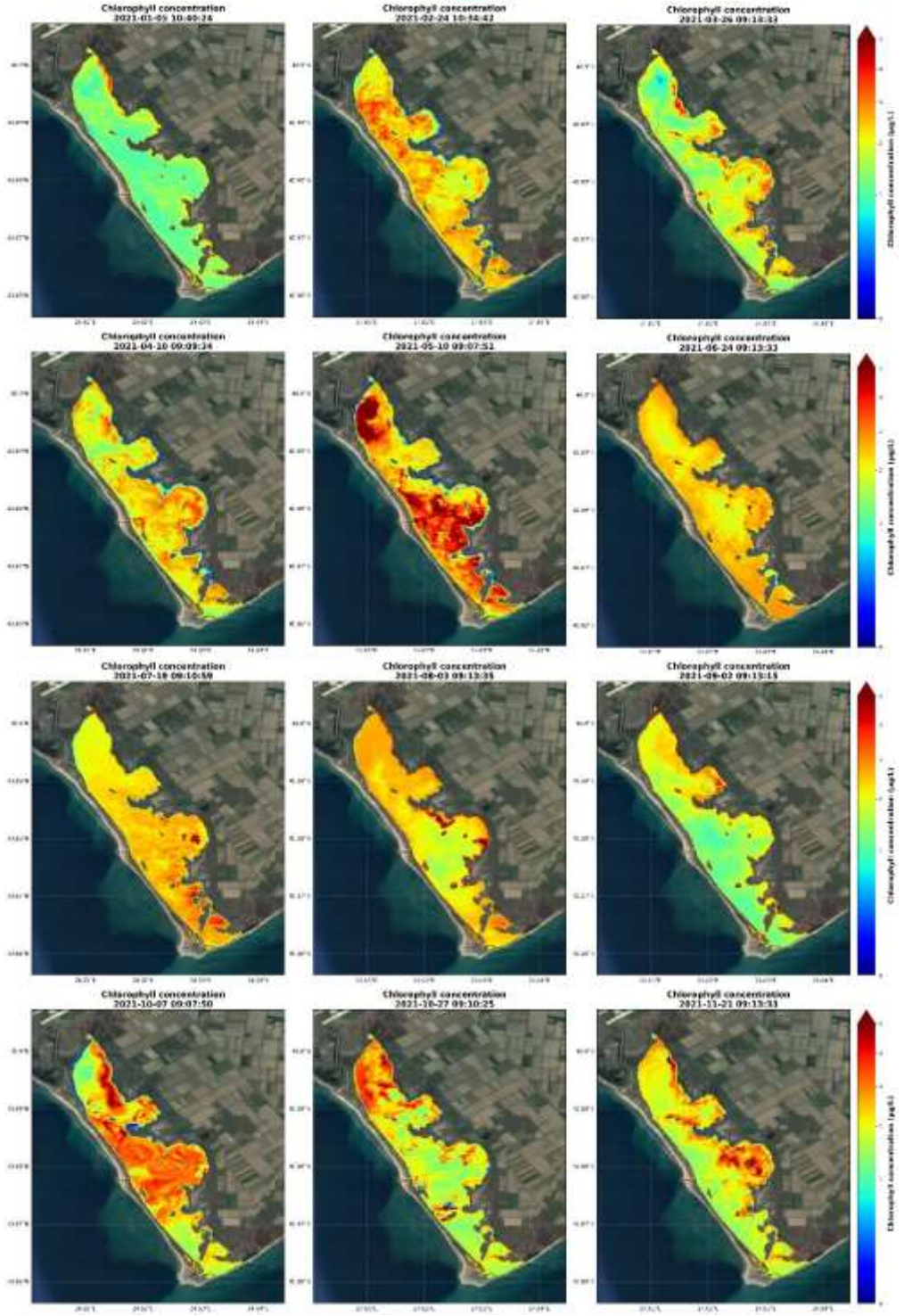

Figure 44. Seasonal evolution of Chl-a concentration in Agiasma lagoon for the year 2021, based on Sentinel 2 satellite images.

3.1.4 Porto Lagos lagoon

Figures 42-51 show the spatial distribution of Chl-a in Porto Lagos lagoon for the years 2013-2021. During 2013 (Figure 45), the highest Chl-a concentration values were reached in late summer. These high values are found at the northeastern part (3.0-5.0 μg/l). On the contrary, the Chl-a values at the southeastern part of the lagoon are lower probably due to the entry of seawater from the eastern lagoon mouth. In the following months, Chl-a values decrease, except from the northern part, where Chl-a values increase, probably due to the water outflown from Vistonis lagoon.

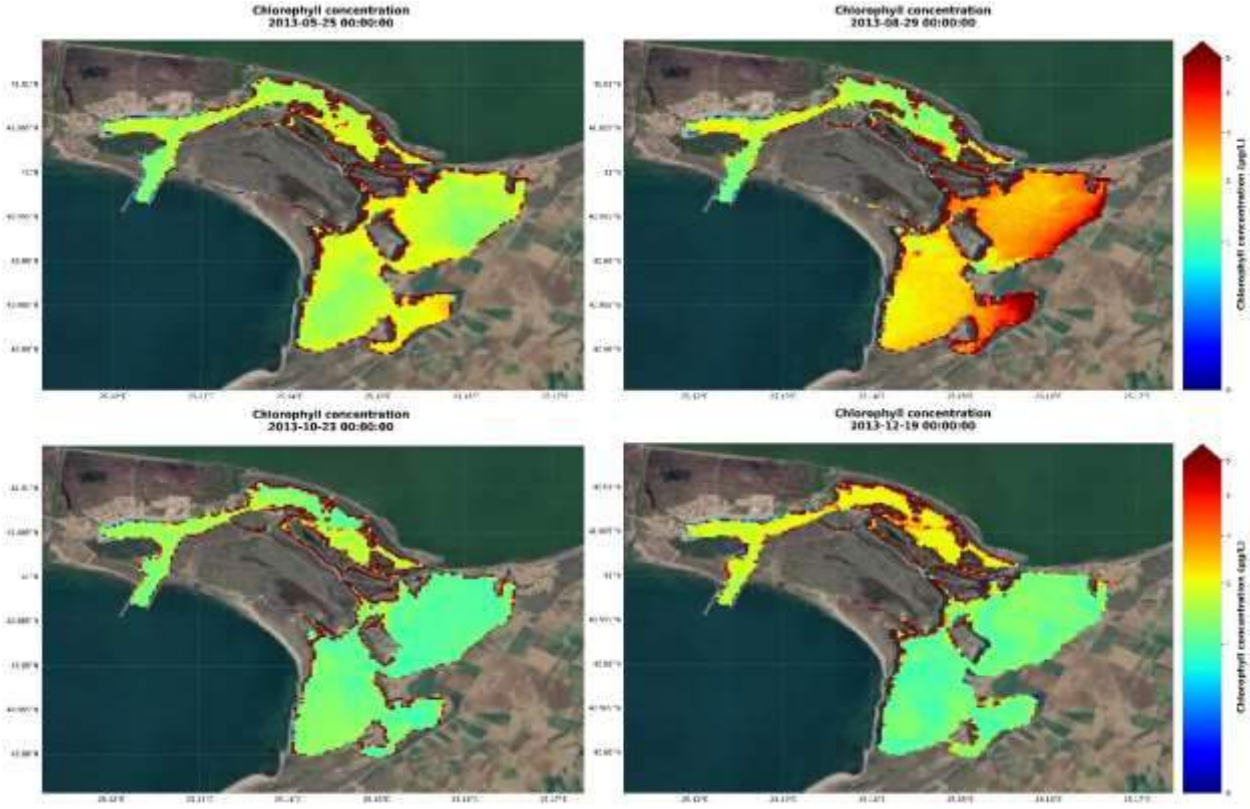

Figure 45. Seasonal evolution of Chl-a concentration in Porto Lagos lagoon for the year 2013, based on Landsat 8 satellite images.

Figure 46 shows the increase of Chl-a from the beginning of January until the summer 2014. Chl-a values in August range from 1.5 to 30 μg/l, with the highest values being shown at the eastern parts of the lagoon. In the following months, Chl-a values decrease (1.0-1.5 μg/l).

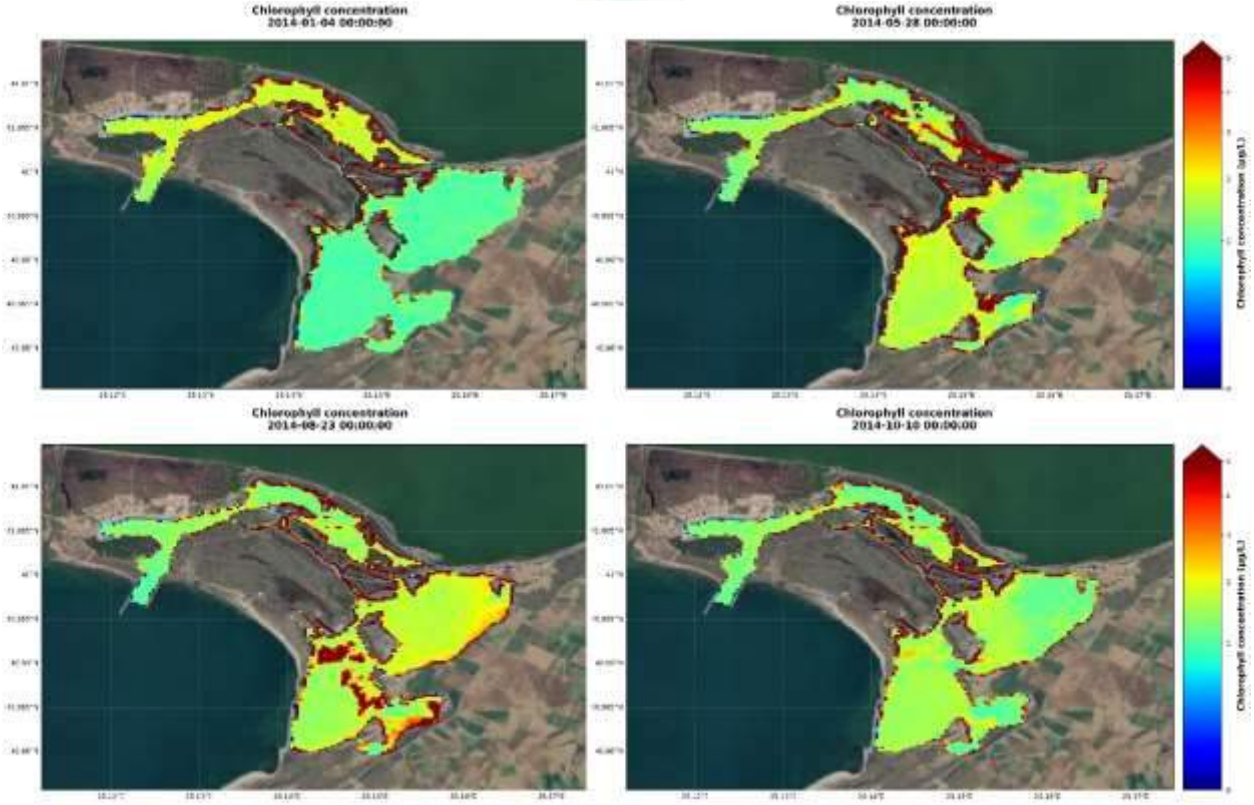

Figure 46. Seasonal evolution of Chl-a concentration in Porto Lagos lagoon for the year 2014, based on Landsat 8 satellite images.

The first half of 2015 is presented in Figure 47 covered by Landsat 8 and the second half is presented in Figure 48 covered by Sentinel 2. The images selected for the first half of 2015 show the gradual increase from low Chl-a in February to higher values in May. The higher values in May are up to 3 µg/l, and they are uniformly distributed across the basin. In June 2015 the values slightly decrease, especially at the northwestern and the northeastern parts.

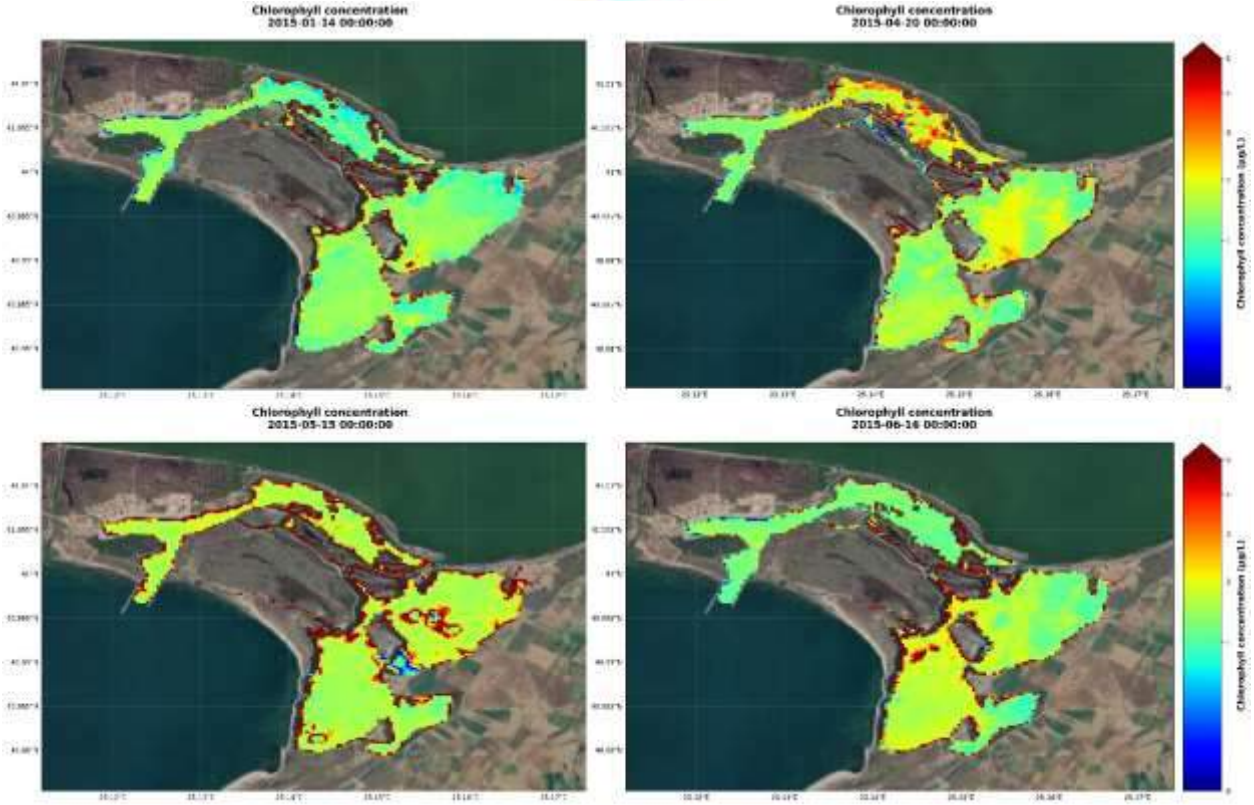

Figure 47. Seasonal evolution of Chl-a concentration in Porto Lagos lagoon for the year 2015, based on Landsat 8 satellite images.

In July and August (Figure 48), Chl-a is almost uniformly distributed across the basin (up to 3.8 μg/l). The highest values are found at the northern part of the basin. In the following months, the Chl-a values decrease considerably.

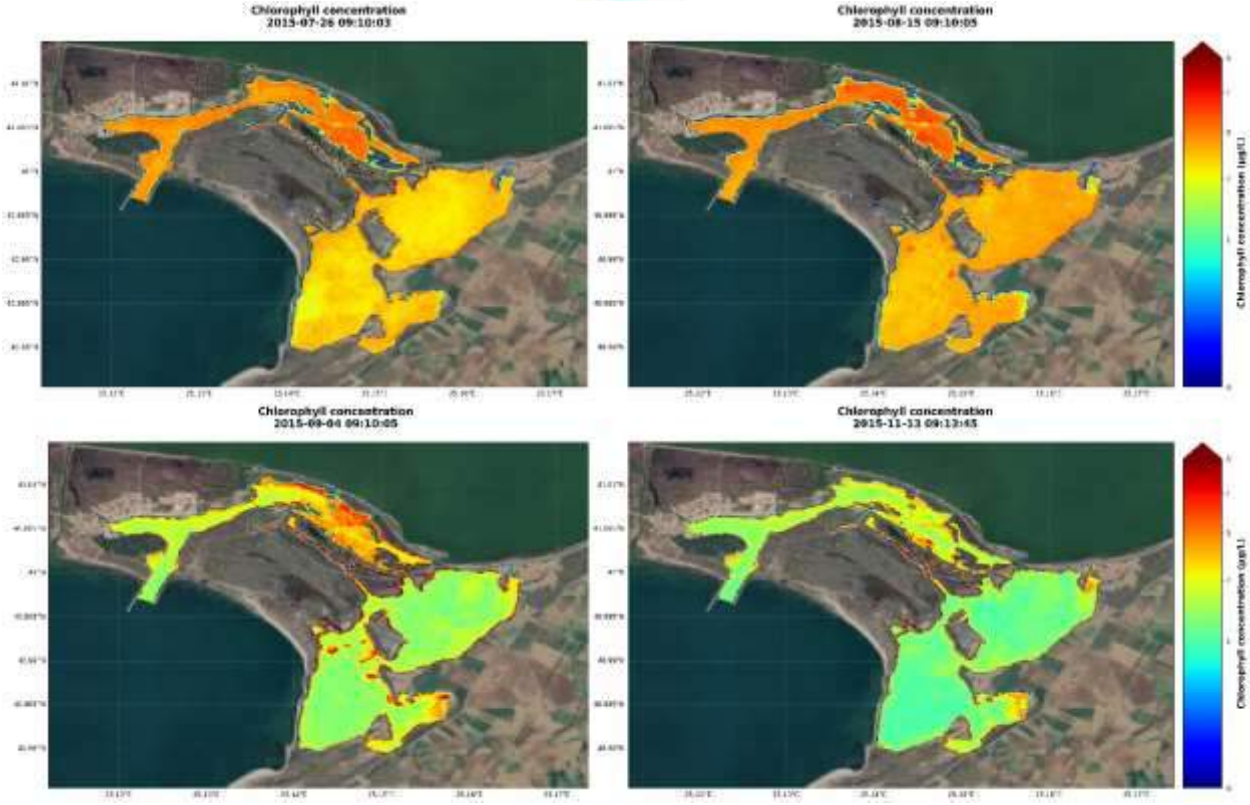

Figure 48. Seasonal evolution of Chl-a concentration in Porto Lagos lagoon for the year 2015, based on Sentinel 2 satellite images.

For 2016 two images during summer and one in winter are presented as due to cloud coverage limited images were available to cover the seasonal cycle of Chl-a (Figure 49). The higher values are observed in July (2.0-3.5 μg/l). The lower values are found at the southern parts of the lagoon. The Chl-a values decrease as we move towards the end of the year.

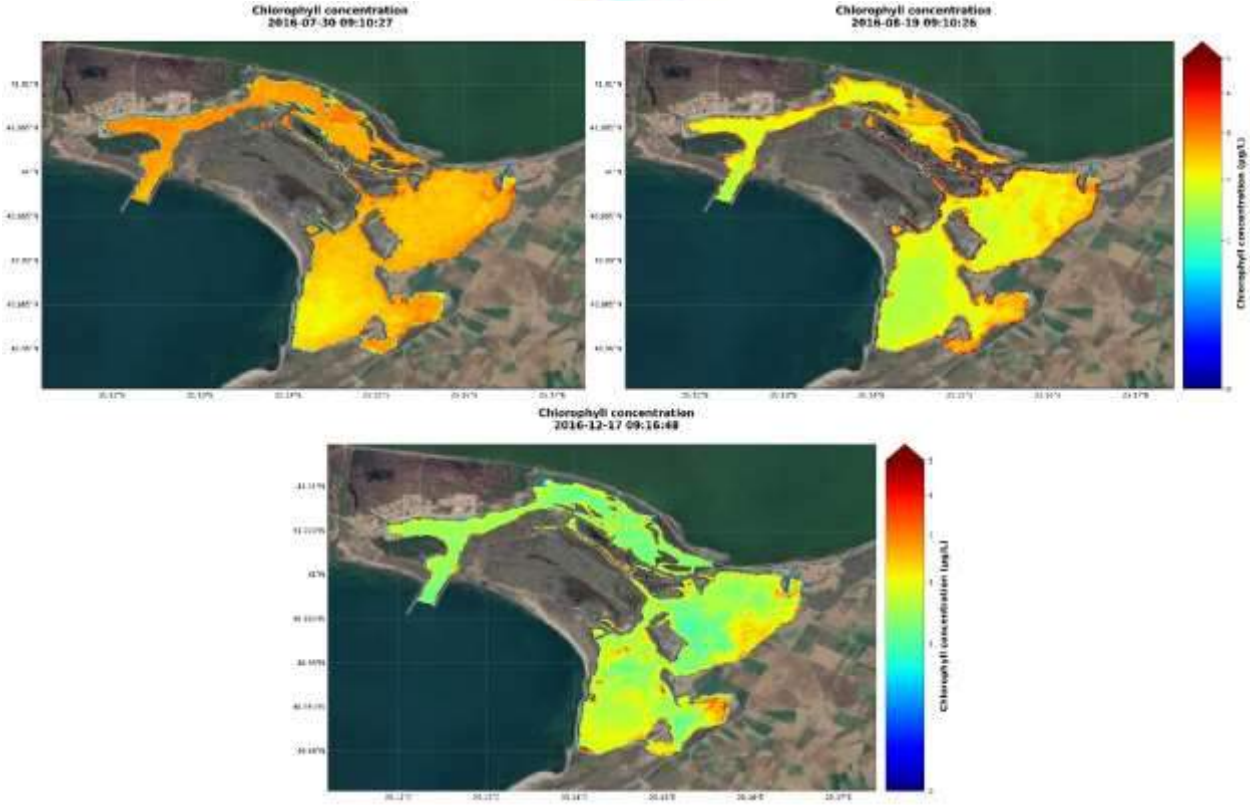

Figure 49. Seasonal evolution of Chl-a concentration in Porto Lagos lagoon for the year 2016, based on Sentinel 2 satellite images.

Figure 50 shows the increase of Chl-a values, from low concentrations in February 2017 to higher at the beginning of August 2017. The increase starts from the south and southeastern parts (April), then to the northern part (June) and then expands to the northeastern sub-basin (August). In the following months, Chl-a decreases reaching its lowest value in November. A slight increase is observed in December, covering the whole basin.

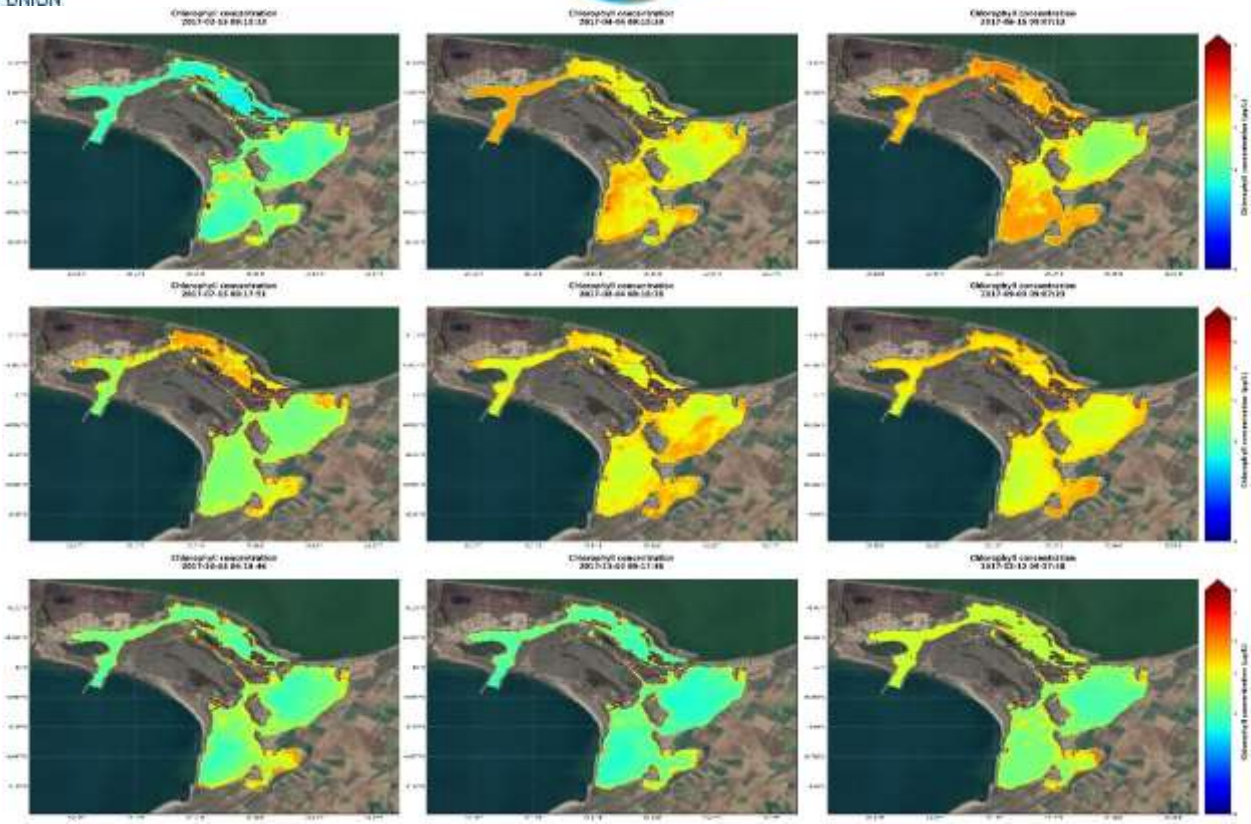

Figure 50. Seasonal evolution of Chl-a concentration in Porto Lagos lagoon for the year 2017, based on Sentinel 2 satellite images.

Figure 51 shows the increase in Chl-a values, from low concentrations in January to higher in May. These values vary from 3.0 to 3.5 μg/l. Chl-a decreases in July but increases again in August. A peak is observed in November, where Chl-a ranges from 2.5 to 4.5 μg/l. The lowest values are reached in December (around 1.0 μg/l).

During 2019 (Figure 52), Chl-a starts to increase until late June, reaching the first peak. The highest values are localized at the southern and southeastern parts (up to 3.5 μg/l). In the following months, Chl-a values decrease. The decrease starts from the northern part, spreading towards the south. In November, a maximum is reached which remains stable until December.

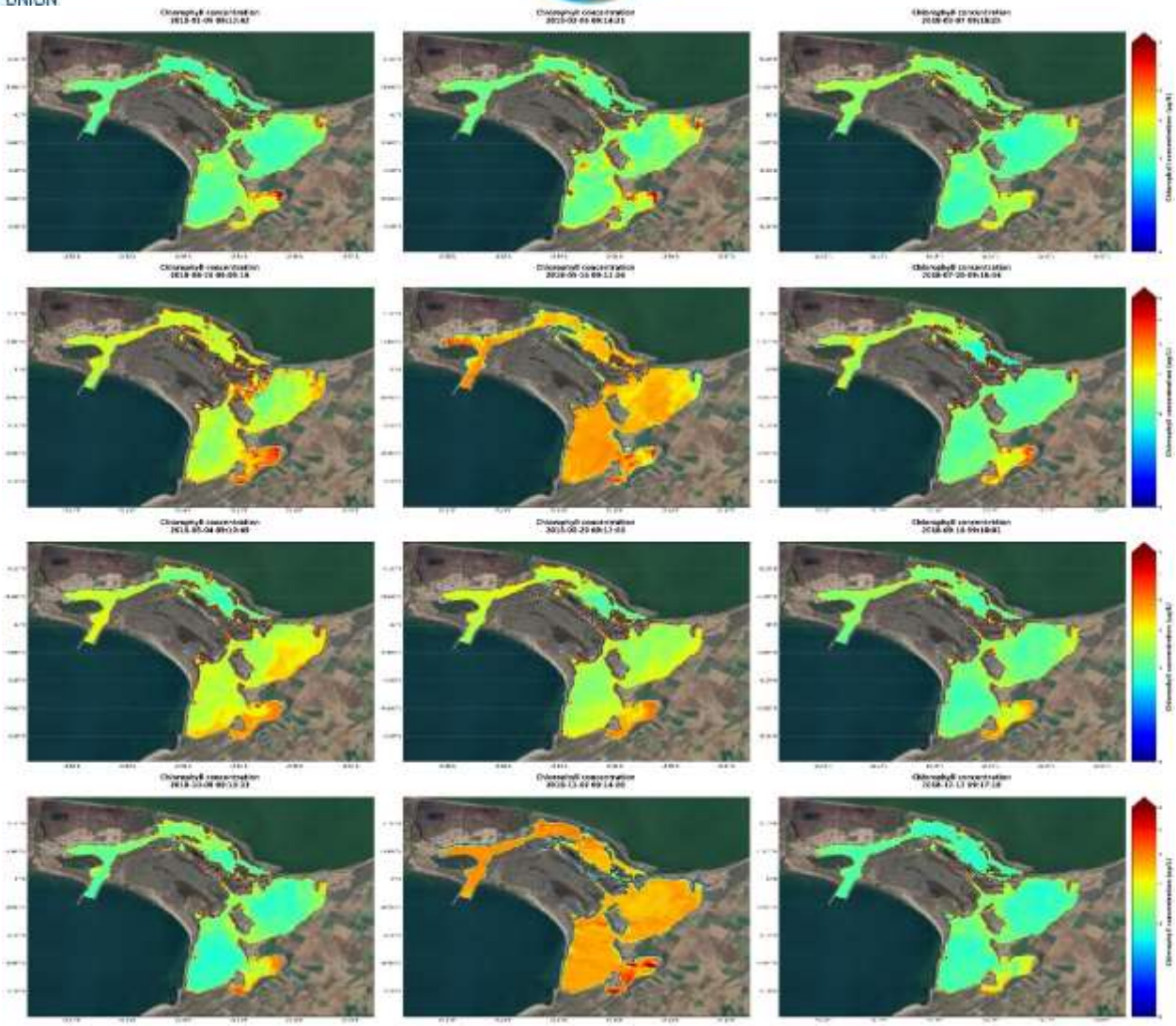

Figure 51. Seasonal evolution of Chl-a concentration in Porto Lagos lagoon for the year 2018, based on Sentinel 2 satellite images.

A decrease from December 2019 to January 2020 was observed, however higher values remained in the lower part of the basin (Figure 53). Those high values spread at the southern parts during February. The first Chl-a peak is observed in July. Chl-a values increase from February and reach their highest values in July. Then, Chl-a decreases until the end of the year.

During 2021 (Figure 54), a maximum in Chl-a values is reached in July with the higher values being confined at the northern parts. In the following months, a decrease is observed as we move towards the autumn and winter months. High Chl-a values are observed in February, especially at the western part and the center of the northeast basin (up to 5.0 μg/l).

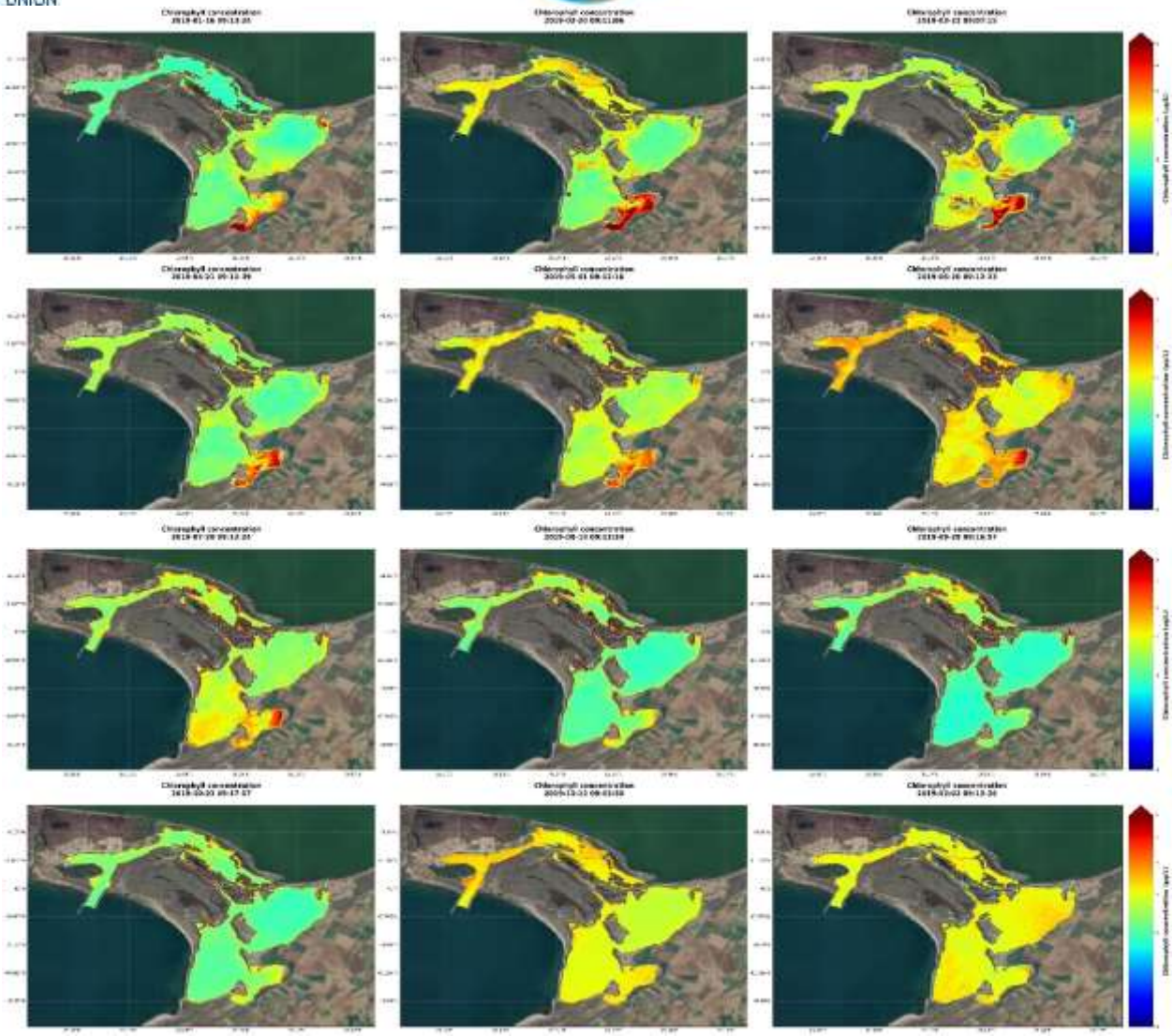

Figure 52. Seasonal evolution of Chl-a concentration in Porto Lagos lagoon for the year 2019, based on Sentinel 2 satellite images.

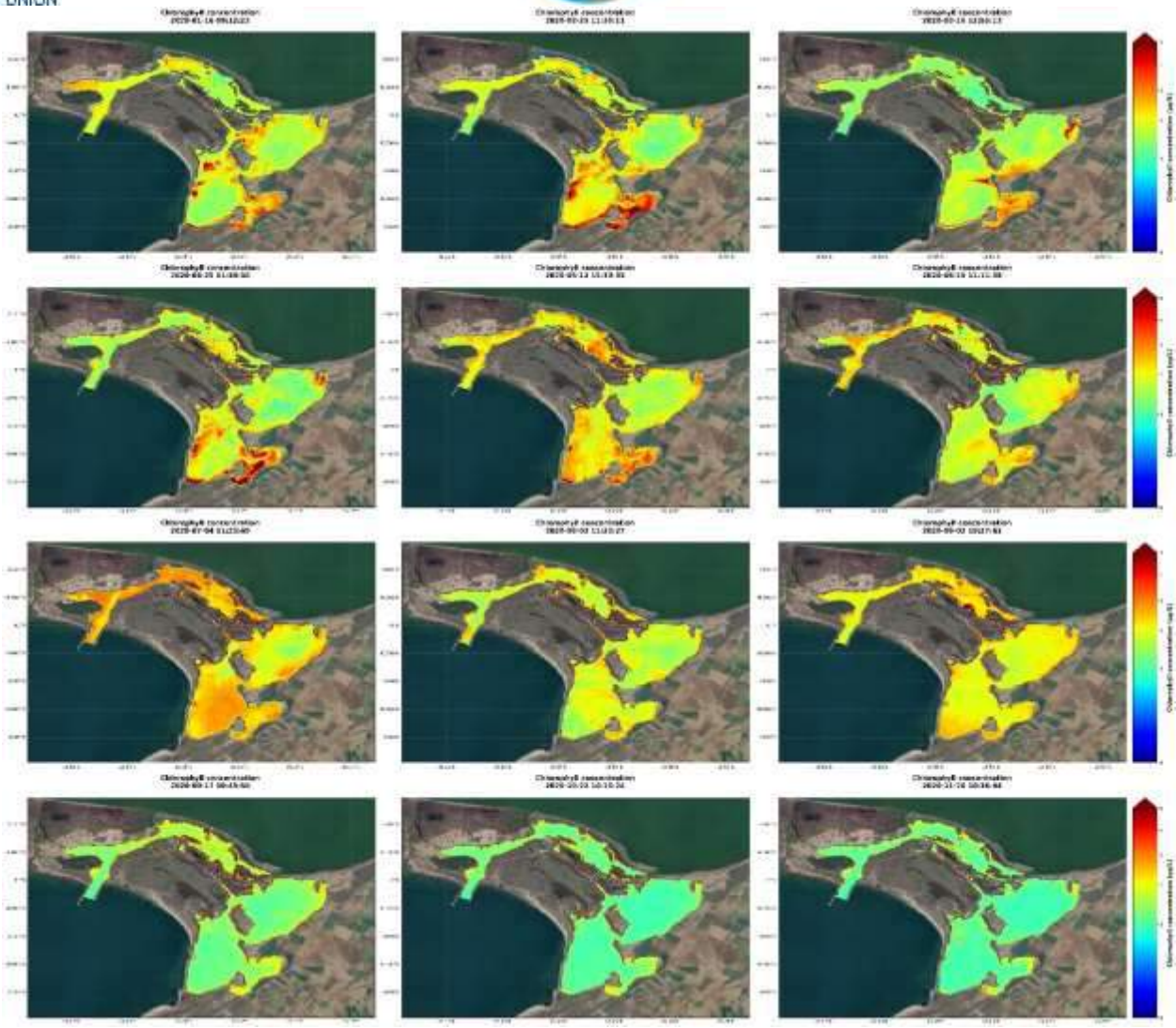

Figure 53. Seasonal evolution of Chl-a concentration in Porto Lagos lagoon for the year 2020, based on Sentinel 2 satellite images.

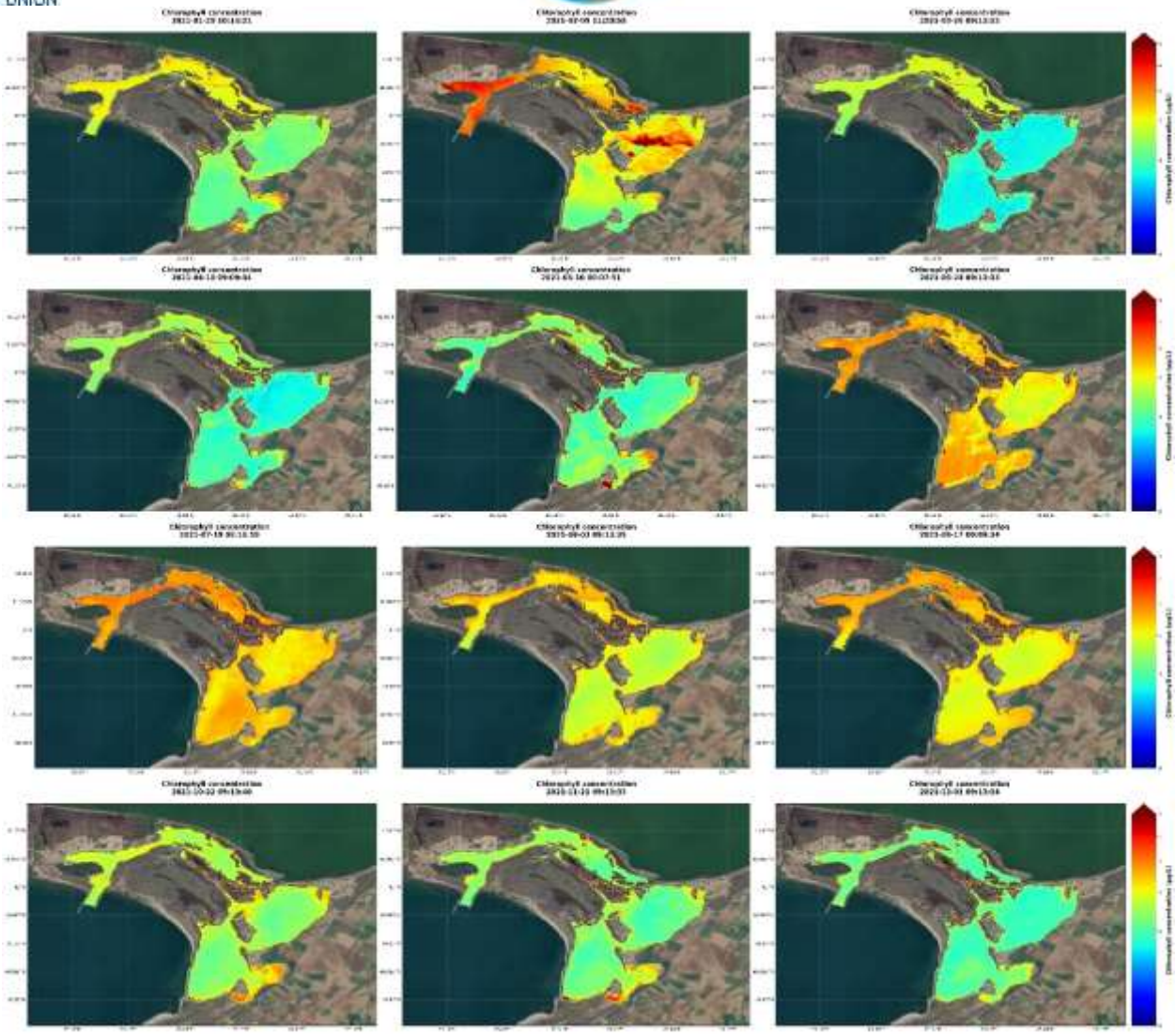

Figure 54. Seasonal evolution of Chl-a concentration in Porto Lagos lagoon for the year 2021, based on Sentinel 2 satellite images.