2 Referee 2 comments (RC2)

Chavan et al study a selection of storm events along a coastal transect in the Eastern English Channel for changes in primary production and phytoplankton composition at size group to species level, resulting from storm event related disturbances. Flow cytometry and microscopy based phytoplankton inventories are investigated for effects of nutrient pulses from riverine outflow and wind driven mixing as a result of storm events. The manuscript reads well and provides valuable insight in weather induced nutrient suppletion in a post-bloom depleted system. The authors identify various mechanisms at play in this complex interaction. Follow-through into conclusions could benefit from some focusing, and some minor points need to be addressed before this worthwhile contribution is published.

We thank the reviewer for the positive comments. We have addressed all comments below, and the manuscript has been modified accordingly. To facilitate the review process, all the references to Lines below correspond to the revised non-annotated version.

General remarks

One thing this reviewer is missing past a cursory mention is tidal effects. Given the very high tidal ventilation in the region, one naturally wonders if the moment of sampling in the tidal cycle has a potential influence on results. I feel this should be addressed in discussion at the very least, and ideally tested for statistically within the data.

We agree that the tidal cycle also shifts the position of the coastal–offshore frontal zone. This is a complex issue that is addressed through DYPHYRAD transect high spatial resolution (~1km) sampling strategy. The "coastal"– "offshore" distinction was defined within the frontal area to ensure that each category consistently captured coastal and offshore waters, regardless of the tidal state. Frontal waters were distributed across both categories, reflecting the strong mixing in this region, and the tidal conditions primarily influenced only the direction of the tidal flow (northwards or southwards; Brylinski et al., 1991). The following statement has now been added to the Materials and Methods section (lines 78–82): "The "coastal"– "offshore" distinction was set within the frontal area to ensure that each category consistently represented coastal and offshore waters, irrespective of tidal state. Because frontal waters are strongly mixed, they span both categories, and tides mainly influence only the direction of flow (northwards or southwards; Brylinski et al., 1991). To account for tidal influences on phytoplankton communities, the sampling strategy used a high-resolution (~1 km) coast–offshore transect comprising nine stations (Fig. 1; Table 1)".

Please also note that DYPHYRAD is an established sampling transect in the coastal EEC (a list of the papers over the last 10 years below)

DYPHYRAD papers 2012–2026:

Bonato, S., Christaki, U., Lefebvre, A., Lizon, F., Thyssen, M., and Artigas, L. F.: High spatial variability of phytoplankton assessed by flow cytometry, in a dynamic productive coastal area, in spring: The eastern English Channel, Estuar. Coast. Shelf Sci., 154, 214–223, https://doi.org/10.1016/j.ecss.2014.12.037, 2015.

Bonato, S., Breton, E., Didry, M., Lizon, F., Cornille, V., Lécuyer, E., Christaki, U., and Artigas, L. F.: Spatio-temporal patterns in phytoplankton assemblages in inshore–offshore gradients using flow cytometry: A case study in the eastern English Channel, J. Mar. Syst., 156, 76–85, https://doi.org/10.1016/j.jmarsys.2015.11.009, 2016.

Breton, E., Christaki, U., Bonato, S., Didry, M., and Artigas, L.: Functional trait variation and nitrogen use efficiency in temperate coastal phytoplankton, Mar. Ecol. Prog. Ser., 563, 35–49, https://doi.org/10.3354/meps11974, 2017.

Christaki, U., Skouroliakou, D., and Jardillier, L.: Interannual dynamics of putative parasites (Syndiniales Group II) in a coastal ecosystem, Environmental Microbiology, 25, 1314–1328, https://doi.org/10.1111/1462-2920.16358, 2023.

Houliez, E., Schmitt, F. G., Breton, E., Skouroliakou, D.-I., and Christaki, U.: On the conditions promoting Pseudo-nitzschia spp. blooms in the eastern English Channel and southern North Sea, Harmful Algae, 125, 102424, https://doi.org/10.1016/j.hal.2023.102424, 2023.

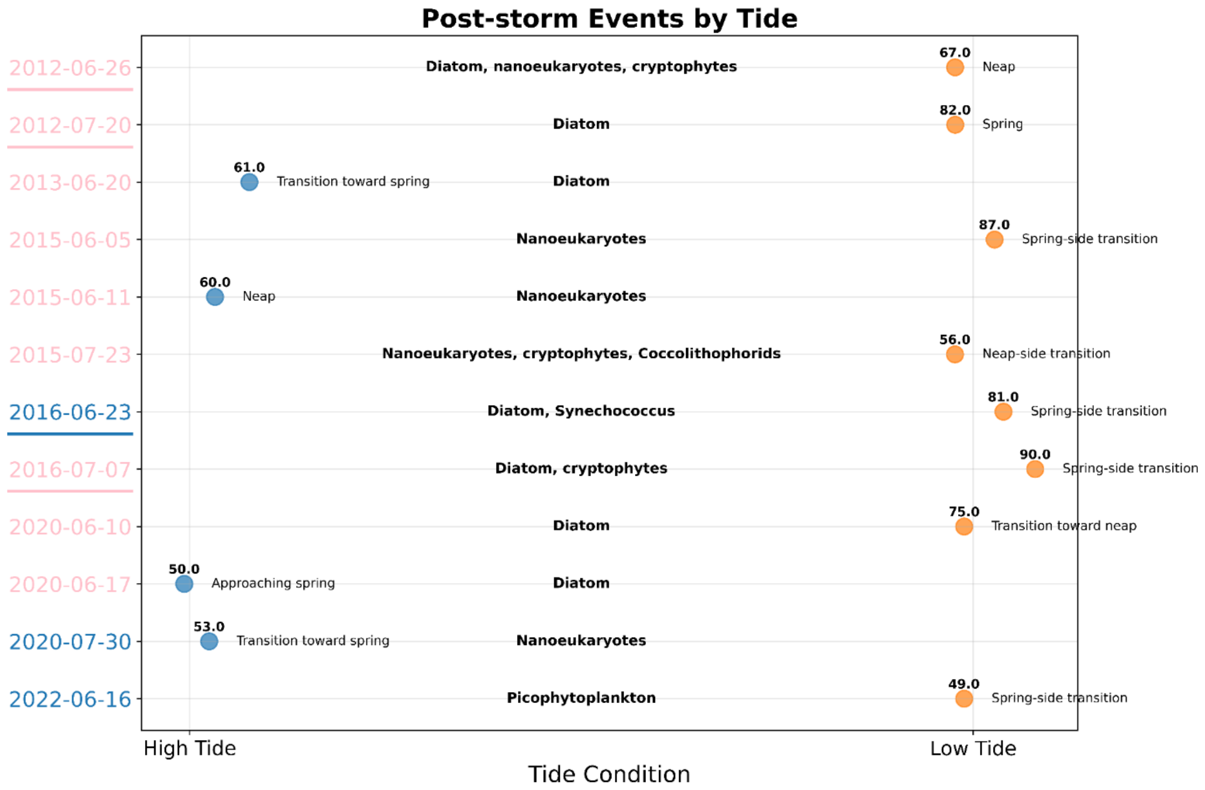
Hubert, Z., Louchart, A. P., Robache, K., Epinoux, A., Gallot, C., Cornille, V., Crouvoisier, M., Monchy, S., and Artigas, L. F.: Decadal changes in phytoplankton functional composition in the Eastern English Channel: possible upcoming major effects of climate change, Ocean Sci., 21, 679–700, https://doi.org/10.5194/os-21-679-2025, 2025.

Hubert, Z., Libeau, A., Gallot, C., Cornille, V., Crouvoisier, M., Lécuyer, É., and Artigas, L. F.: Phytoplankton coastal-offshore monitoring by the Strait of Dover at high spatial resolution: the DYPHYRAD surveys, Earth Syst. Sci. Data, 18, 1877–1903, https://doi.org/10.5194/essd-18-1877-2026, 2026.

Skouroliakou, D.-I., Breton, E., Irion, S., Artigas, L. F., and Christaki, U.: Stochastic and Deterministic Processes Regulate Phytoplankton Assemblages in a Temperate Coastal Ecosystem, Microbiol. Spectr., 10, e02427-22, https://doi.org/10.1128/spectrum.02427-22, 2022.

Skouroliakou, D., Breton, E., and Christaki, U.: *PHAEOCYSTIS GLOBOSA* and diatom blooms promote distinct bacterial communities and associations in a coastal ecosystem, Environ Microbiol Rep, 16, e13313, https://doi.org/10.1111/1758-2229.13313, 2024.

In addition, following the referee's comments, we analysed the post-storm tidal conditions in relation to phytoplankton community structure. The figure shows that, despite the spring, neap, and transitional tidal situations, we did not identify any clear pattern between the phytoplankton communities that increased after storms and the prevailing meteorological conditions (wind and inflow). This is illustrated in the figure below. We decided not to include this figure in the manuscript.



The figure shows the post-storm sampling dates, and the x-axis denotes the tidal conditions during sampling. Pink dates correspond to high wind-stress storms, whereas blue dates correspond to low wind-stress storms. The underlining denotes high-inflow storms.

The discussion could benefit from a bit more attention as to why community structure responds in the way it does. Growth and nutrient utilisation strategies are well-described for the identified groups, and tying these to the different modes of nutrient suppletion with some more detail and focus would strengthen the manuscript.

We have discussed nutrients and phytoplankton as exhaustively as our data permitted and based available literature. We however added the following:

"This study highlights that certain diatom genera and species are able to dominate storm-driven summer blooms; specifically, *Leptocylindrus danicus* in June and *Chaetoceros socialis* in July. This suggests that these taxa are well adapted to post-storm conditions associated with riverine nutrient supply under the well-lit conditions of summer (Polimene et al., 2013; Widdicombe et al., 2010). Moreover, while diatoms in offshore waters during the summer are generally confined to subsurface layers (20–30 m; Barnett et al., 2019), riverine nutrient inputs and mixing can promote their proliferation in surface waters across the transect (e.g., Fig. 7B and F3 in Appendix F)." Lines 506–512

The discussion identifies a number of mechanistic system responses to storm events, but the conclusions as they are tend to reduce these to stochastic disturbances. This puts the sections somewhat at odds with each other, and it would benefit the manuscript to follow through on mechanistic insights into the conclusions.

We agree with the reviewer that the discussion surrounding stochastic mechanisms (Skouroliakou et al., 2022) is beyond the scope of the present study. This part of the text is now shortened and completely rephrased.

"While previous research in this region attributed summer phytoplankton blooms and community turnover primarily to stochastic processes (69%; Skouroliakou et al., 2022), the underlying drivers of these disturbances remained unclear. The present study elucidates these patterns by identifying weather-induced nutrient suppletion as a key mechanism in an otherwise nutrient-depleted environment after the spring bloom. We found that recurrent storms disrupted seasonal succession, triggering short-lived but pronounced community shifts characterized by transient monospecific peaks such as *Leptocylindrus danicus* and *Chaetoceros socialis* observed in our study. Similar storm-related shifts have been documented in other aquatic systems—for example, the post-storm dominance of cryptomonads in a temperate lake (Jacobsen and Simonsen, 1993) and reduced phytoplankton diversity linked to stochastic processes in the Yangtze River Estuary (Xian et al., 2024)—highlighting the wider relevance of our observations i.e., post-storm high abundance of certain phytoplankton groups." Lines 544–553

Apart from cursory mentions, extrapolation beyond the immediate locality is limited. Some more discussion of transport into the highly ventilated channel system would be appreciated.

Regarding transport processes, our aim was not to investigate transport dynamics directly, but rather to use the available information on wind forcing, inflow, and phytoplankton as environmental context for interpreting our results. Nevertheless, we have clarified and expanded the discussion of transport-related processes in the Materials and Methods section (lines 153 and 157) and the Discussion section (lines 420, 494, 500, 517 and 519).

Specific remarks

line 85-86 repeated statement

We removed the repetition from the introduction.

line 91-94 repeating statements

We removed the statements and replaced them with "To account for tidal influences on phytoplankton communities, the sampling strategy used a high-resolution (~1 km) coast–offshore transect comprising 9 stations (Fig. 1; Table 1). The transect spans approximately 9.7 km from coast to offshore, from R0 (50.8° N, 1.59° E) to R4 (50.8° N, 1.45° E) (Fig. 1). To facilitate analysis of spatial patterns, stations were categorized into two zones based on their proximity to shore: coastal (R0–R2) and offshore (R2'–R4)." Lines 81–85

line 114, 143, 145 inconsistent capitalisation "Phytobs"

This was made consistent with PHYTOBS throughout the document.

line 215-216 dates have inconsistencies with those on the figures' axes

We corrected the dates at lines 191–192 and now it is consistent throughout the document.

In a more general sense I struggled a bit with the use of just the event dates to identify them, a new reader can lose track somewhat easily. It might help to add another identifier to the events? Worth trying, though the dates are logical and abstraction could have its own issues. Perhaps both?

To improve readability, we have clarified the presentation of the storm events and now summarise them in Tables 3 and 4. We have chosen to retain the event dates as the primary identifiers, as they allow readers to follow the sequence of observations and link each storm directly to the corresponding phytoplankton responses in the region. We hope that the improved tabular summary provides the additional clarity the reviewer was seeking.

line 237, 449 consider 'depletion' in stead of 'limitation' in these instances, the ECC is hardly a limited system.

We removed line 237 and replaced limitation with "marked by low silicate, nitrate, and phosphate" in line 438.

line 254 "Some years were notably windy days" this statement seems to be missing some words.

We revised the sentence now: "Some years were characterised by notably windy conditions (days with wind speeds > 8 m s^{-1}; at least 10 days per month) despite low inflows, including July 2014, 2015, July 2017, July 2020, and June 2022.” Lines 239-240

line 489-499 consider moving to results

This was moved to the result section 3.2.2; Lines 359–370.