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Editorial

Oceanic-Atmospheric Oscillations' Impact On Rivers.

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INTRODUCTION

We invited experts that specialize in studying how oscillations in the ocean and atmosphere affect weather patterns and climate, disrupting hydrological phenomena, to contribute to this Special Issue. We believe that the primary objective has been accomplished. Investigations based on measurements, modeling, and experiments pertaining to a broad range of changes in river and lake hydrology on various scales, from local and regional to global approaches, were submitted for this Special Issue. We are confident that readers of the journal Water will gain from these new discoveries, get a better understanding of how the ocean and atmosphere affect hydrology through the published papers, and disseminate the findings to stakeholders, policymakers, and the scientific community.

SPECIAL ISSUE SYNOPSIS

Using the bivariate Archimedean copulas, Plewa et al. [1] evaluated relationships between the water levels of the Baltic Sea and six lakes in Poland that are situated along its southern shore. The maximum yearly water levels in the lakes and the Baltic Sea at the gauge stations under investigation were found to have substantial and statistically significant correlations. The synchronization study, which was conducted using the copula function, validated the findings. Additionally, it was found that the Baltic Sea's maximum water levels were trending upward. The authors deduced from these results that sea level rises brought on by climate change may strengthen the relationship.Plewa et al. [2] found correlations between lake water levels and indicators of macroscale atmospheric circulations, including the Scandinavian pattern (SCAND), the East Atlantic (EA), the North Atlantic (NAO), and the Arctic Oscillation (AO). Their study was based on the mean monthly water levels of 15 lakes in northern Poland from 1976 to 2015.The most significant links were found in the correlation analysis between AO and NAO, particularly during the winter, whereas EA and SCAND showed somewhat lesser relationships. It was discovered that these teleconnection patterns had an impact on precipitation to a lesser extent and air temperature specifically. Consequently, they can have an indirect impact on the lake's nutrient conditions.

During milder winters, when AO and NAO are in positive phases, In their meta-analysis of research findings published in international scientific journals, Kundzewicz et al. [3] looked at the climate variability indices of the Pacific Decadal Oscillations (PDO), the North Atlantic Oscillations (NAO), the Atlantic Multidecadal Oscillation (AMO), and the El NiñoSouthern Oscillations (ENSO). Using criteria such as areas, modes of climatic variability, and flood-related variables like precipitation, river flow, and flood losses, the authors compiled the published results and categorized them into various groups. For these reasons, it has been discovered that the ocean-atmosphere system's spatially defined oscillations influence the climate and other climate impacts across wide regions, including the oceans, neighboring continents, and farther-flung locations through teleconnections. The authors identified zones of effect where the climate variability mode (e.g., ENSO, PDO, NAO, or AMO) affects flood-related variables, and they disclosed that the link intensity can differ from region to region.During the multi-year period from 1971 to 2013, Bednorz et al. [4] characterized and categorized the atmospheric processes that caused summer floods in the Polish Sudeten Mountains.The anomaly maps that were created made it possible to identify regions of positive departures of precipitable water content over Europe as well as to identify the early creation of negative centers of sea level pressure. Five cyclonic circulation patterns, each with a distinct origin, extent, and intensity, were identified by the authors as the cause of the study area's heavy, flood-triggering precipitation.

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The study demonstrated that synoptic circumstances play a crucial role in causing copious rainfall and verified a direct correlation between heavy precipitation and exceptionally high runoff occurrences. It was determined that while some of the cyclones that brought rain to the Polish Sudeten Mountains formed over the Atlantic Ocean, the majority formed over the Mediterranean Sea.The impact of the North Atlantic Thermohaline Circulation (NA THC) on the noted alterations in Poland's climate and river flow was detailed by Wrzesi ´nski et al. [5]. The process by which the NA THC changeability affects the components of the variability of the catchment water balance was described and examined in the study.

The DG3L index showed statistically significant negative relationships with total cloud cover and statistically significant positive correlations with average yearly air temperatures, especially in April, July, and August.

Therefore, there are excellent conditions for a significant rise in ground surface evapotranspiration and evaporation in the years when the DG3L index is positive. This affects Poland's river flow, which is marked by observable regional variations. Graf and Wrzesi ´nski [6] assessed the impact of large-scale circulation types, including NAO, AO, EA, EAWR, SCAND, and AMO, on the water temperature of Polish rivers using daily data from 96 water gauges on 53 rivers and air temperature data from 43 meteorological stations over the multi-year period from 1971 to 2015. The character of teleconnection was demonstrated by calculating the percentage shares of positive and negative coefficients of correlation between air and river water temperature and annual, seasonal, and monthly circulation type indices. Although the relationships between macroscale circulation types and river water temperature in Poland were not very strong, they were nevertheless discernible, occasionally even statistically significant, and varied over time and space.

Wrzesi ´nski and Sobkowiak [7] observed a change in the flow regime of a large allochthonous river in Central Europe, using the Vistula River in Poland as an example.

During the multi-year period from 1971 to 2010, the authors used data from 38 gauges on the Vistula's tributaries and 22 gauges on the Vistula mainstream. The various hydrological period sequences seen in the average annual cycle mirrored the change in the Vistula flow regime. It was discovered that although the Vistula River regime underwent changes along its entire course, the most frequent alterations were seen in its upper, mountainous sections, where the flow characteristics of its tributaries had an impact. As a result, the Vistula may now be regarded as an allochthonous river. In the multi-year period from 1965 to 2016, Cerón et al. [8] examined the effects of the Atlantic Multidecadal Oscillation (AMO) on the fluctuations in streamflow in the Atrato River Basin in Northwestern Colombia. This oscillation's cold (1965–1994) and warm (1995–2015) phases were examined. The streamflow means at Bellavista during May to June and November to December, as well as the rainfall means during November to December, increased significantly from the first to the second period under analysis, according to the results. It was discovered that the Atrato River Basin's rainfall and streamflow fluctuations were significantly influenced by the Atlantic Ocean. On the temporal scale of low frequency,

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