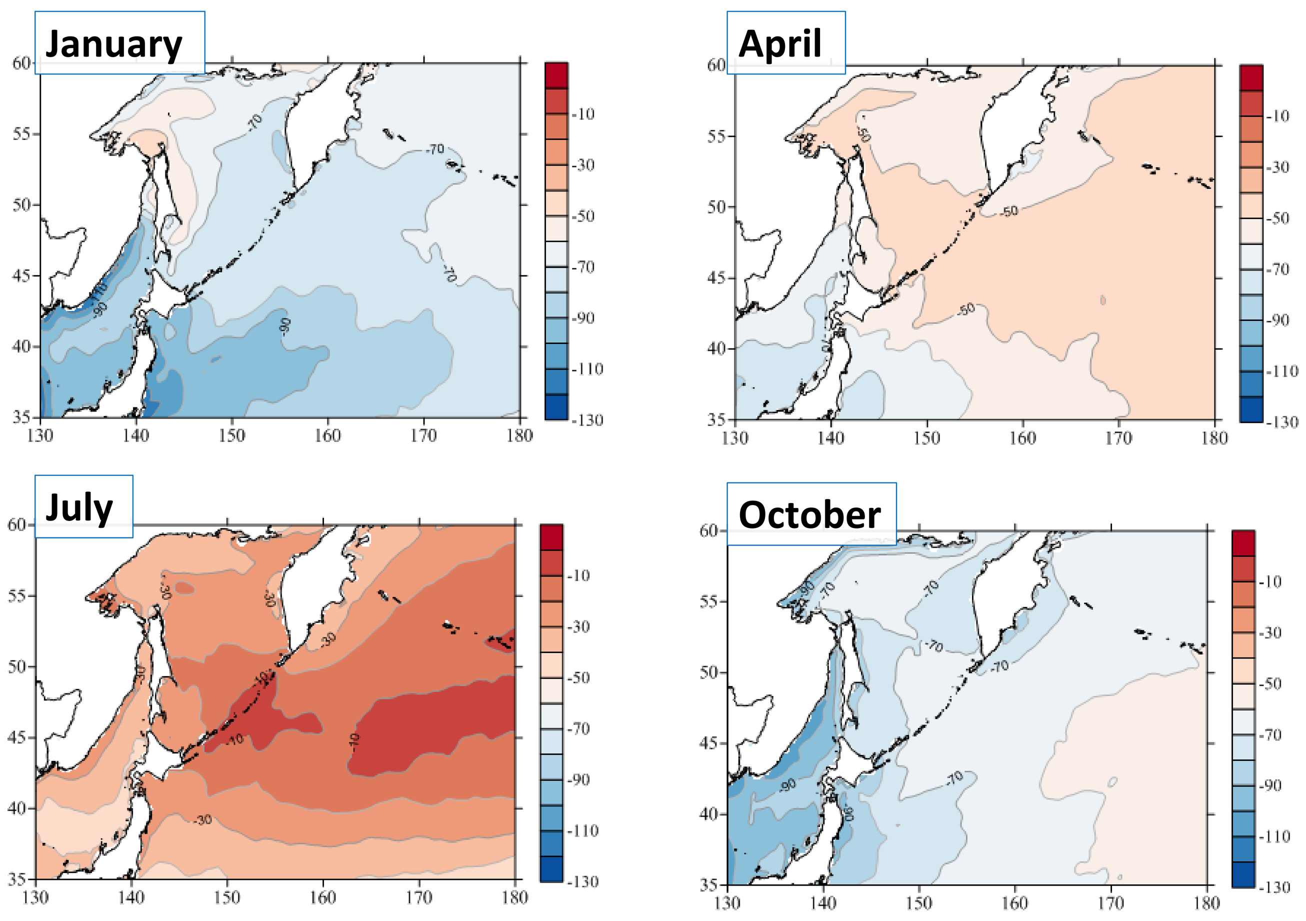
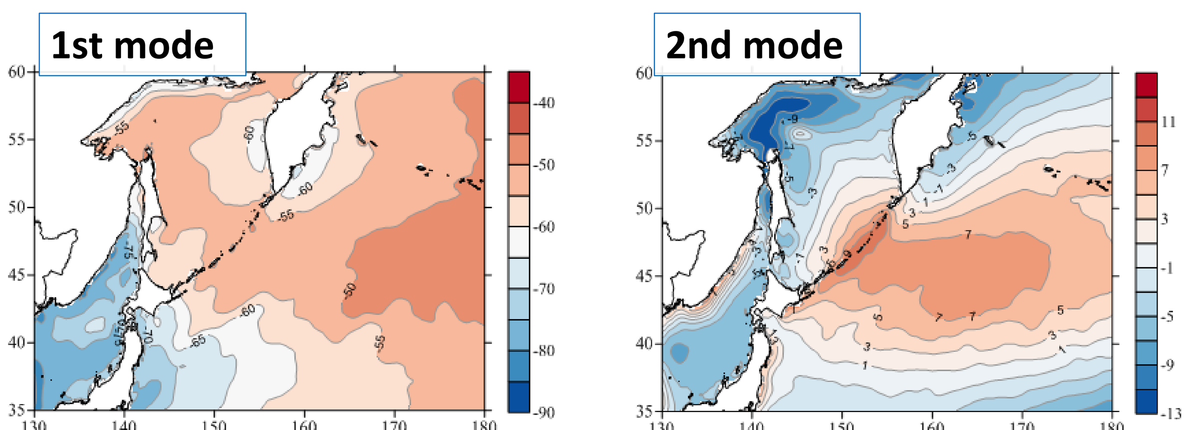
MULTIYEAR-MEAN VALUES



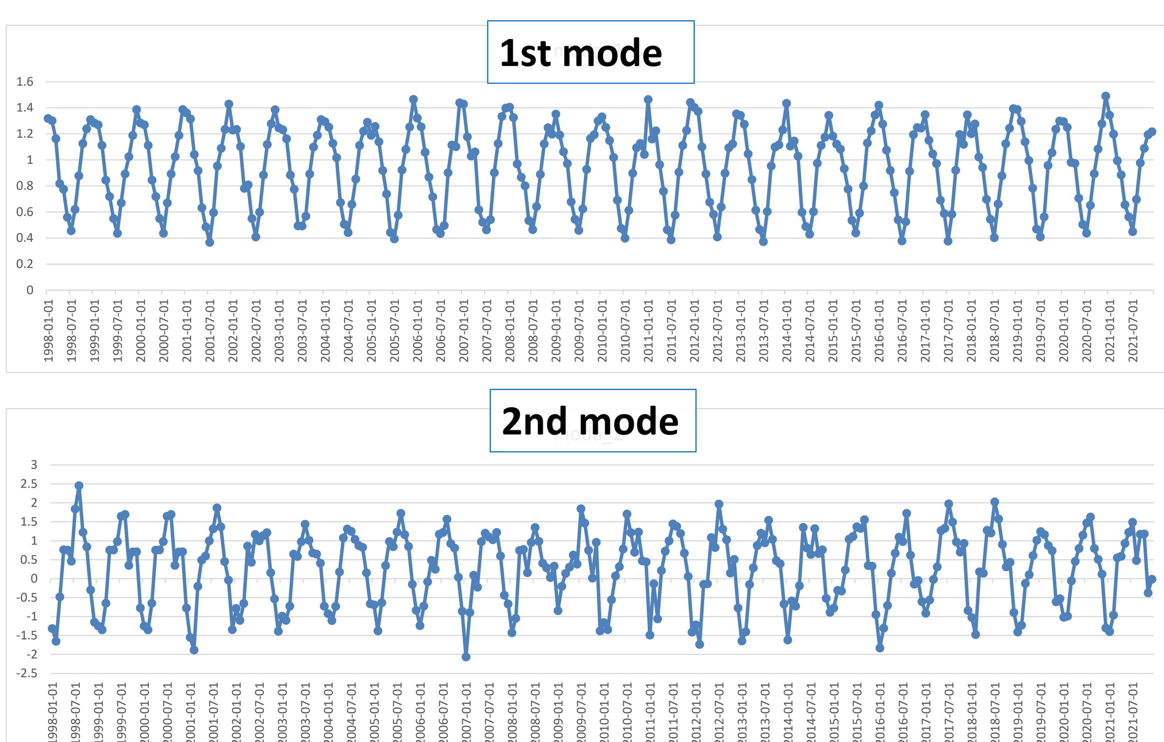
unit of measure: W / m²

FIRST AND SECOND EOF MODES (SPATIAL COEFFICIENTS)



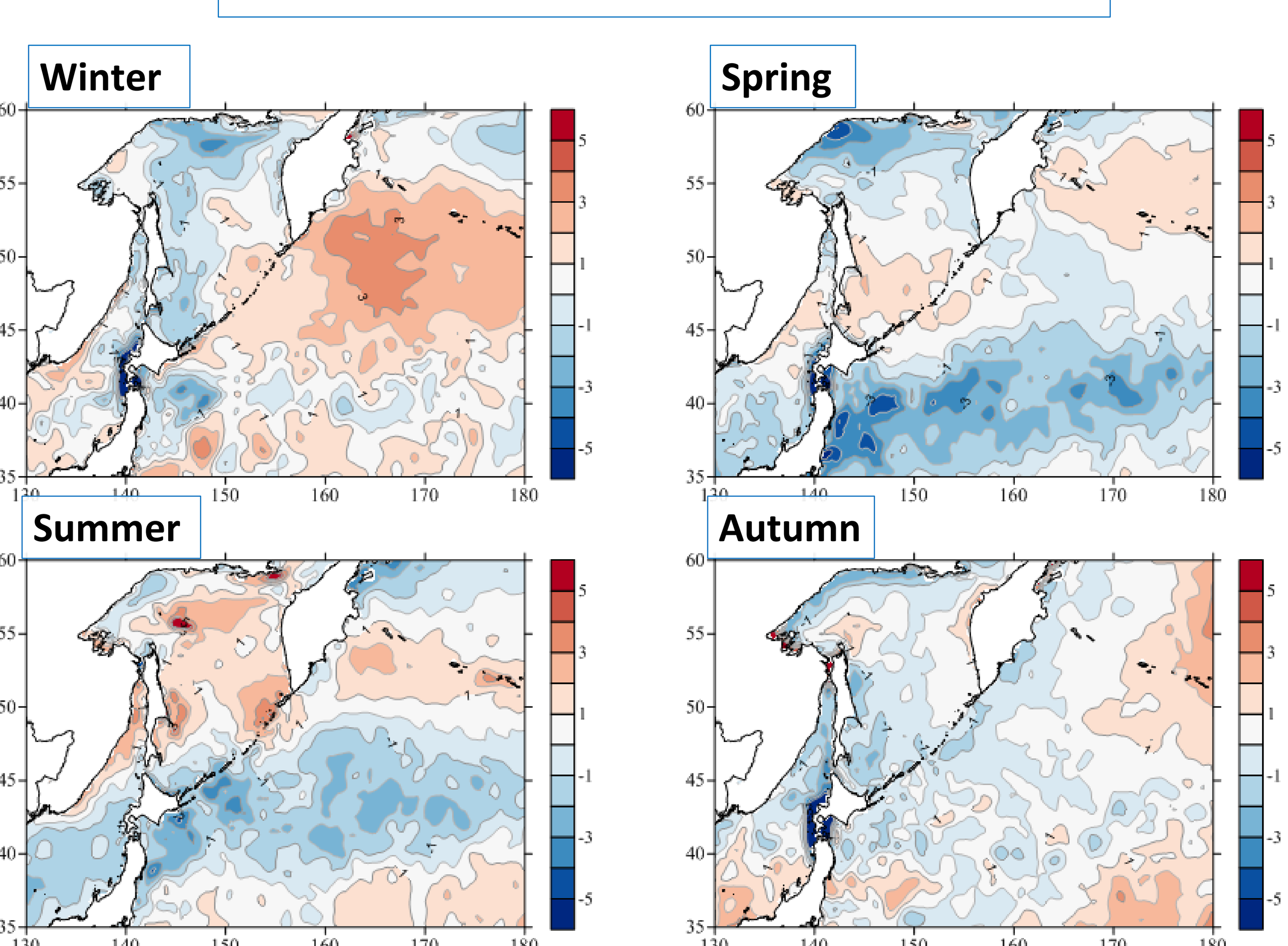
unit of measure: dimensionless

FIRST AND SECOND EOF MODES (TIME FUNCTIONS)



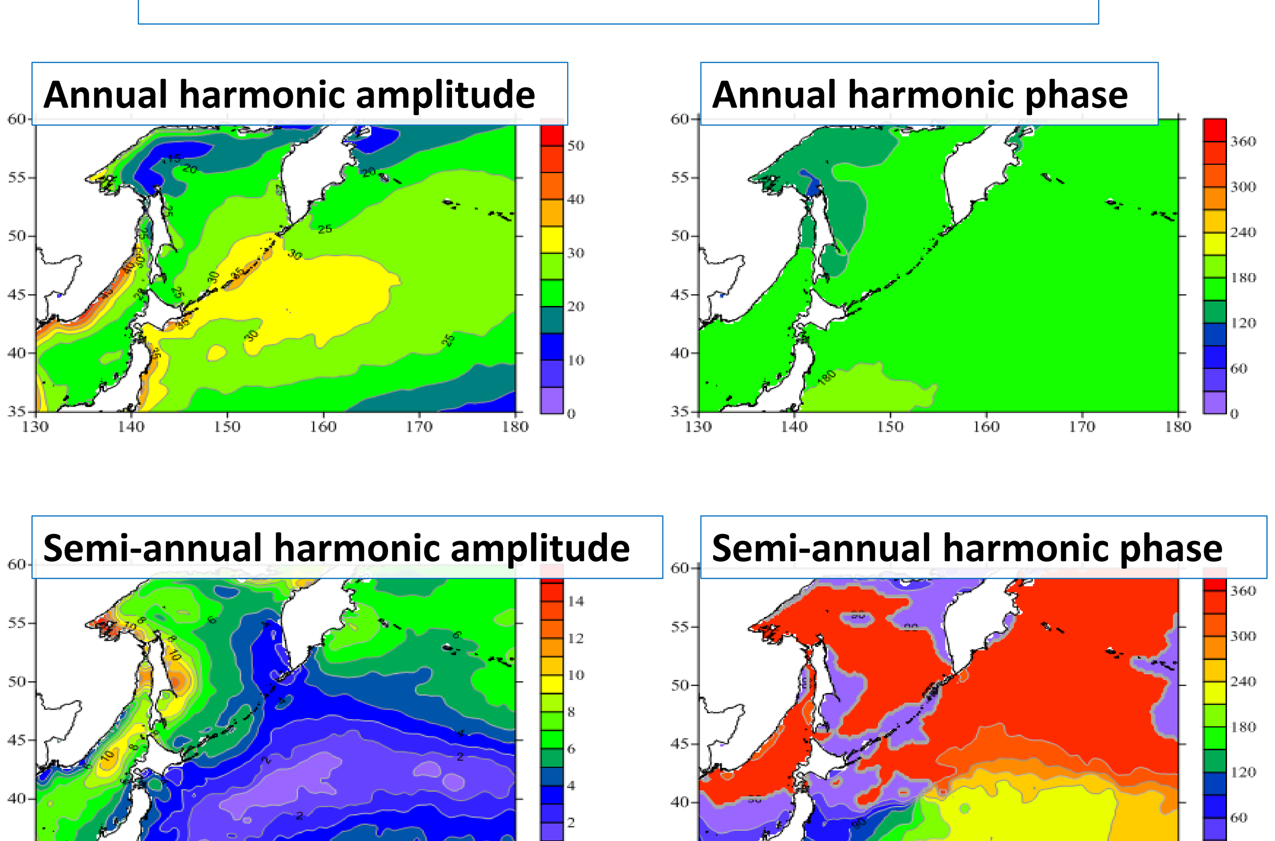
unit of measure: W / m²

LONGWAVE RADIATION FLUX TRENDS



unit of measure: W / m² per 10 years

AMPLITUDES AND PHASES OF ANNUAL AND SEMI-ANNUAL HARMONICS



unit of measure: W / m²

unit of measure: degree

S7 (BIO/FIS/POC/FUTURE/HD) 15673

SEASONAL AND INTERANNUAL VARIABILITY OF LONGWAVE RADIATION FLUX IN THE NORTHWESTERN PACIFIC OCEAN ACCORDING TO ERA5 REANALYSIS DATA

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Introduction

There are many parameters that affect the temperature of the ocean surface, which in turn determines the conditions for the existence of various aquatic organisms. One of these parameters is mean surface net long-wave radiation flux (LWRF). This parameter is the amount of thermal radiation (also known as longwave or terrestrial radiation) refers to radiation emitted by the atmosphere, clouds and the surface of the Earth. This parameter is the difference between downward and upward thermal radiation at the surface of the Earth. It is the amount of radiation passing through a horizontal plane. The atmosphere and clouds emit thermal radiation in all directions, some of which reaches the surface as downward thermal radiation. The upward thermal radiation at the surface consists of thermal radiation emitted by the surface plus the fraction of downwards thermal radiation reflected upward by the surface. To establish how the level of thermal radiation changes in space and time, an analysis of unidirectional trends and periodic fluctuations was carried out

Materials and methods

Average monthly values of LWRF in the region of 35 - 60°N and 130 - 180° E for the period 1998-2021, with a spatial resolution of a quarter of a degree, were downloaded from the public site https://cds.climate.copernicus.eu. Methods - calculation of average long-term values (norms) for each month and construction of spatial distributions of LWRF trends and harmonic amplitudes and phases. Time-space analysis using EOF method.

Results and discussion

It was revealed that the long-wave radiation flux, which expresses ocean heat loss, reaches the highest absolute values in winter and autumn in the Sea of Japan, in the western part of the Sea of Okhotsk and the part of the NWPO adjacent to the eastern coast of Honshu Island. A narrow strip along the entire continental coast stands out especially in the autumn period; obviously, this effect is due to the northwestern offshore winds influence (winter monsoon). In winter, in areas north of latitude 48°, this phenomenon is less pronounced, probably due to the ice cover influence. LWRF minimum absolute values are observed in July, sometimes in August.

LWRF spatiotemporal variability is well described by the first EOF mode, which spatial function values increase in absolute value from east to west. The variations of its time function are dominated by the annual variation with an amplitude of 0.4 W/m², the interannual variations are expressed in its low-frequency modulation.

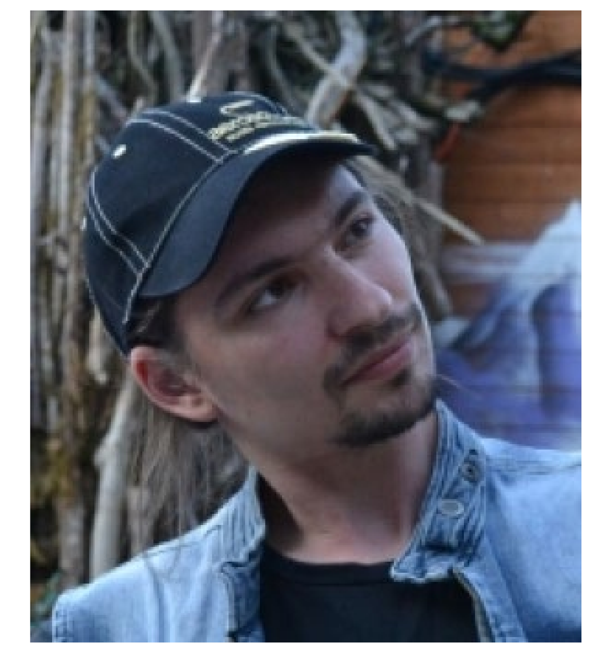
In winter, positive trends were observed in most of the studied water area with relatively low rates (1-3 W/m² per 10 years), the highest values were noted in the NWPO to the east of the Kamchatka Peninsula. Weak negative trends (about −2 W/m² per 10 years) were found in the northern and western parts of the Sea of Okhotsk, as well as off the western and southern coasts of Hokkaido. Trends with absolute value of more than 5 W/m² per 10 years off the southwestern coast of Hokkaido, which are also observed in spring and autumn, may be due to errors in the reanalysis data in this area.

In spring, positive trends (1–3 W/m² per 10 years) were found in the southern part of the Sea of Okhotsk and in the area of the Aleutian island arc, to a greater extent in the southern part of the Bering Sea and to a lesser extent in the adjoining part of the NWTO. Negative (from −4 to −1 W/m² per 10 years) were detected in the northern part of the Sea of Okhotsk and in the area of the subpolar front, along the 40° N latitude.

In summer, positive trends (with approximately the same values of the linear trend coefficient) are observed in most of the Sea of Okhotsk, in the northern part of the Sea of Japan, and in a small section of the NWTO near the Aleutian Islands. In the southern part of the Sea of Japan and in most of the water area of the NWTO, the trends are negative.

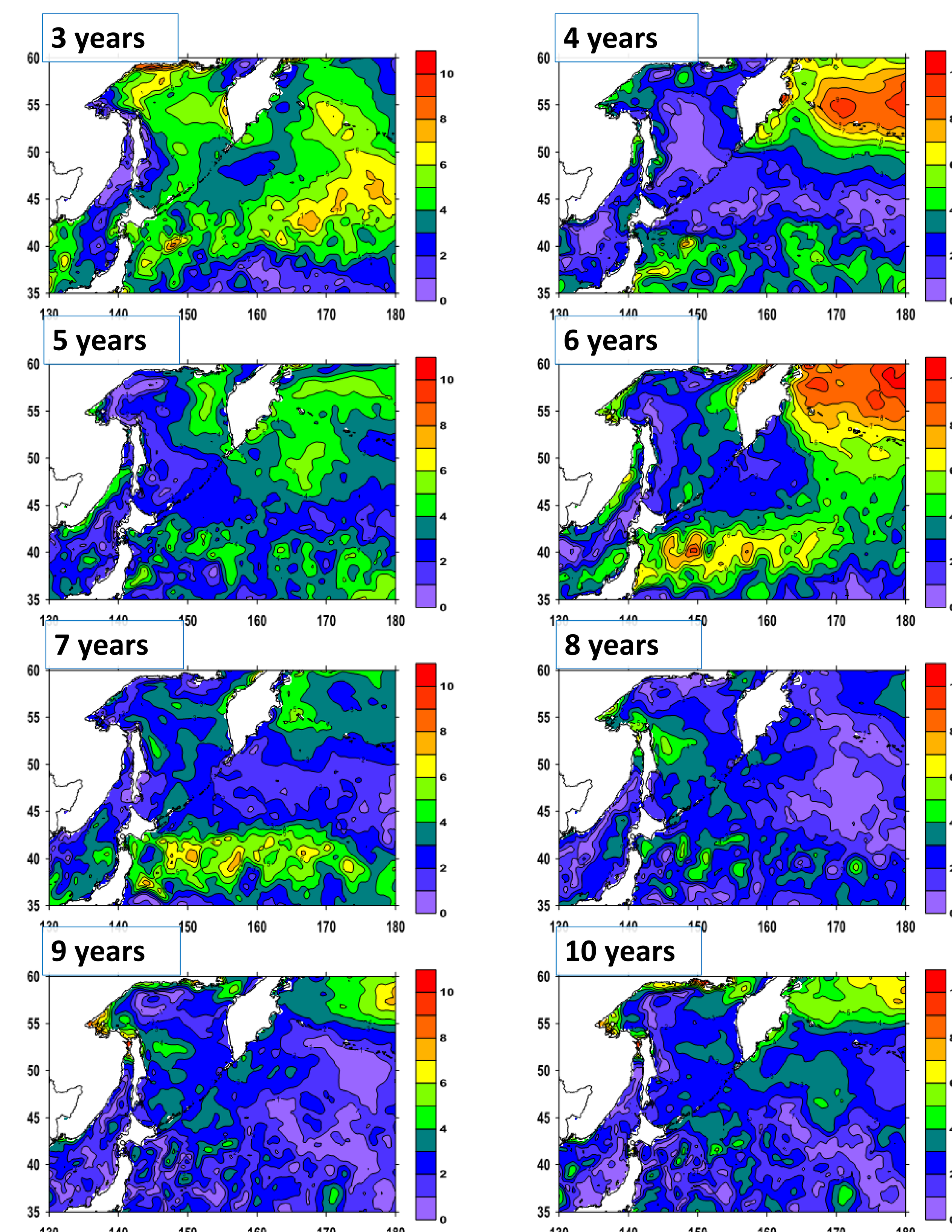
In autumn, unidirectional trends in changes in the long-wave radiation flux are not expressed, the value of the linear trend coefficients in the main part of the study area is small.

In winter maxima variations, the role of the three-year component, which manifests itself in the eastern part of the Sea of Okhotsk, is most significant. In summer minima fluctuations, the most interesting is the 11-year cycle, which influence zone is concentrated on the northern shelf of the Sea of Okhotsk and coincides with the manifestation area of the short-wave radiation flux similar component.



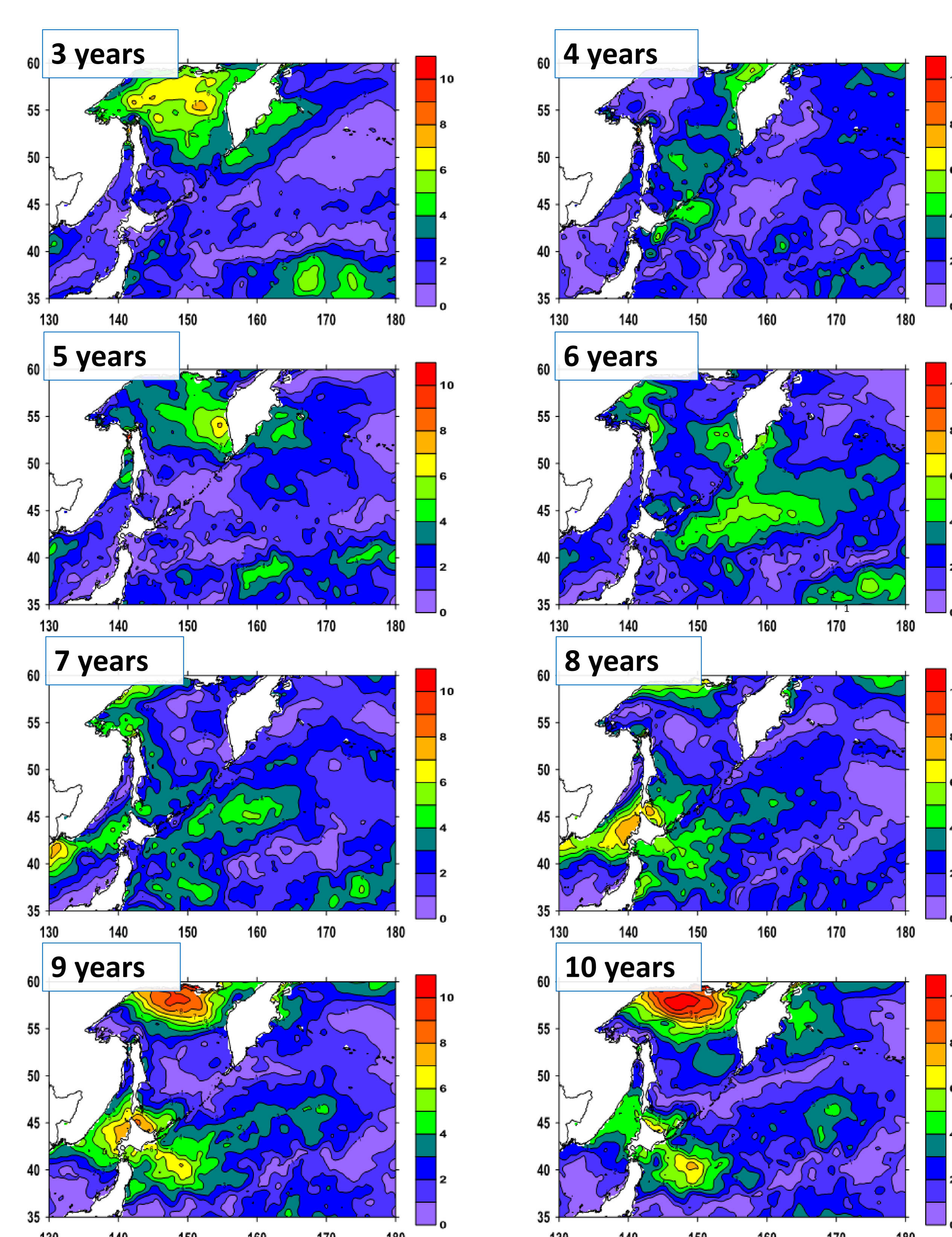
Dmitriy Lozhkin **George Shevchenko**

AMPLITUDES OF CYCLIC COMPONENTS (DECEMBER)



unit of measure: W / m²

AMPLITUDES OF CYCLIC COMPONENTS (JULY)



unit of measure: W / m²