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The proceedings of the international research-to-practice conference on 'Climate Services: Science and Education' are presented in the collected volume. The reports cover the principle results of researches in the field of issues of climate services in the climate-sensitive economic sectors; education in climate services; climate risks and adaptation to climate change on regional and local levels.

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CLIMATE CHANGE AND THE FREQUENCY OF SQUALLS ON THE TERRITORY OF THE NORTH-WESTERN BLACK SEA REGION

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A squall is a sharp short-term increase in the wind, accompanied by changes in its direction and is a vortex with a horizontal axis developing under the influence of mesoscale atmospheric convection. Squalls are local and have a short-time influence, therefore they are difficult to register by standard methods. The fact of the phenomenon is often recorded only after its termination, with the help of data from remote sensing of the Earth from space. The accuracy of forecasting squalls by modern methods is still insufficient. In addition, there are practically no methods for forecasting disastrous squalls. Therefore, researches on squalls are continuing around the world, forecasting methods are being developed and perfected.

Most often squalls occur in the central part of a powerful thunderstorm cloud, with very high air humidity during the formation of precipitation [1]. The diagnosis of such local phenomena is quite difficult, especially when the phenomenon develops in a sparsely populated area, and even if a squall occurs in a densely populated area, most often the fact of its passage and intensity can be judged by the results of the damage caused.

Geographical position of the south of Ukraine, synoptic processes and a variety of climatic conditions contribute to the frequent occurrence of severe convective phenomena and creating the extraordinary complexity of their distribution in space and time. In recent years, due to significant climate change frequency of these events has increased. Despite the short duration of the impact, the squall causes significant damage to the economy, infrastructure and population.

Since the existing observational network in Ukraine is not enough for the diagnosis of convective phenomena and, in particular, a squall, it is necessary to equip the network with sensors for continuous registration of the meteorological situation. The most optimal instrument for determining the structure and physical characteristics of a squall line is a meteorological radar. World over, Doppler Weather Radar is recognized as the most versatile tool for squall analysis. On the basis of unambiguous and complex recognition criteria, radars in automatic mode allow not only to detect and recognize convective hazardous phenomena, but also to obtain information on the horizontal and vertical structure of the radar reflectivity of storms, the horizontal and vertical velocity of cloud particles and precipitation drops inside the cloud with a resolution of up to 1 km after 5-10 minutes.

One of the most squall-prone regions of Ukraine is the territory of the North-Western Black Sea. During the period from 2006 to 2020 there was an increase in

the number of squalls on the territory of the North-Western Black Sea region in comparison with previous years. If for fifteen years from 1991 to 2005, according to [2], an average of 28 squall cases were observed, then for 2006 -2020, according to the data of storm warnings from the HMC BAS it was 261.

The largest number of squalls in all three regions was observed in 2010 (43), the maximum number of squall situations per year was noted in 2013 in the Odessa region − 25 cases. The minimum recurrence rate of squalls falls on the Kherson region, where the maximum annual rates during the study period did not exceed 7 cases (2010). In the Nikolaev region, the frequency of squalls varied from 1 to 13 cases (2010) (Fig. 1).

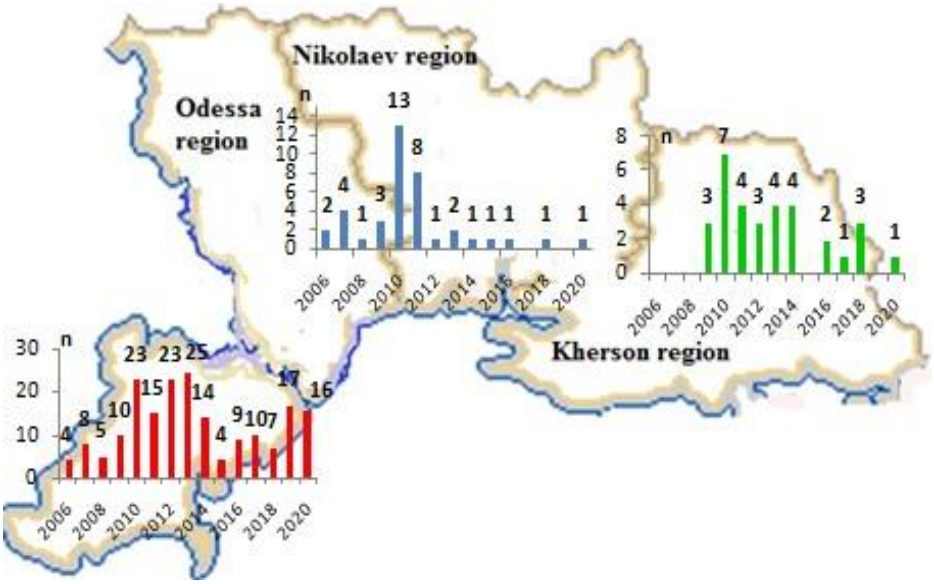

Fig. 1. The number of cases of squalls on the territory of Nikolaev, Odessa and Kherson regions by years. 2006-2020.

The increase in the number of squalls and, accordingly, the emerging risks associated with this phenomen are most likely associated with climate change, namely, with an increase in the meridional circulation. The penetration of warm air masses of subtropical anticyclones into high latitudes and cold arctic air into the southern regions leads to the formation of the most intense convective phenomena, including squalls.

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Наукове електронне видання

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