

INTRODUCTION

Climate changes have caused temperatures to rise in recent decades in all seasons of the year in Belarus. The average growth rate of the average annual temperature starting from the late 90s of the XX century was 0.4°C/10 years, which exceeds the average value around the globe. The most intense temperature increase is observed in winter – by 0.6°C, in spring and summer – by 0.5°C, in autumn – by 0.3°C.

Heat waves is one of the most dangerous hydrometeorological phenomena, the manifestations of which have become more frequent in recent decades around the globe. Due to very high temperatures, which are maintained for a long period of time, heat waves cause thermal stress in living organisms and plants and have a negative impact on various sectors of the national economy. The process of heat wave formation is well studied, but the question of definition and prediction remains open, including due to the lack of a unified concept of a heat wave.

OBJECTIVE

This study analyzes the frequency of extreme high temperatures in Belarus in the period from May to September (the warm period of the year) and heat waves in the summer season of 2003-2022.

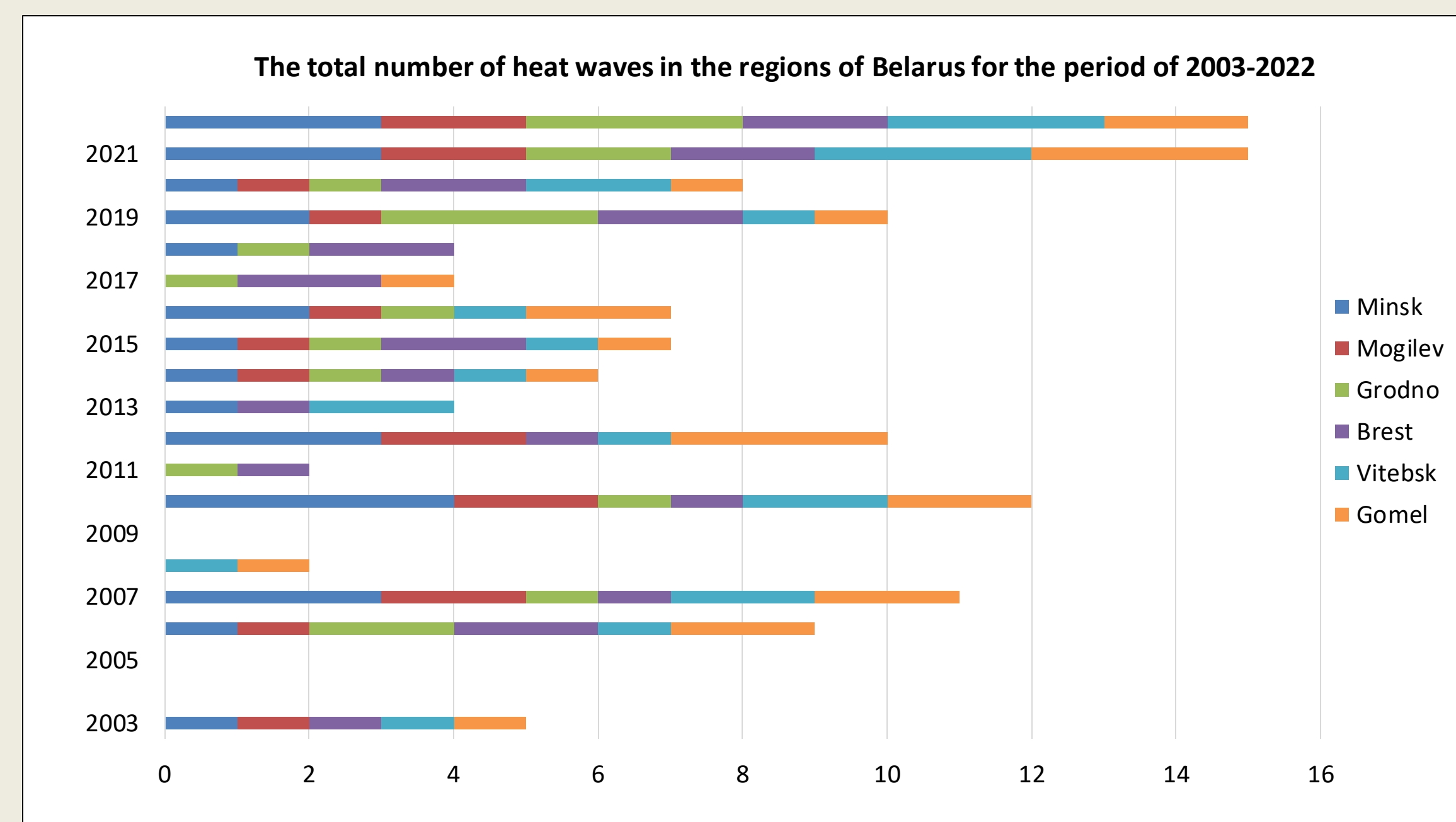
MATERIALS AND METHODS

To analyze extremely high temperatures and heat waves in the warm period of the year in the modern climatic period in Belarus were used data on the maximum air temperature calculated from the daily temperature fields of the EURO-CORDEX project (Copernicus Climate Data Store) and averaged across regions of the country.

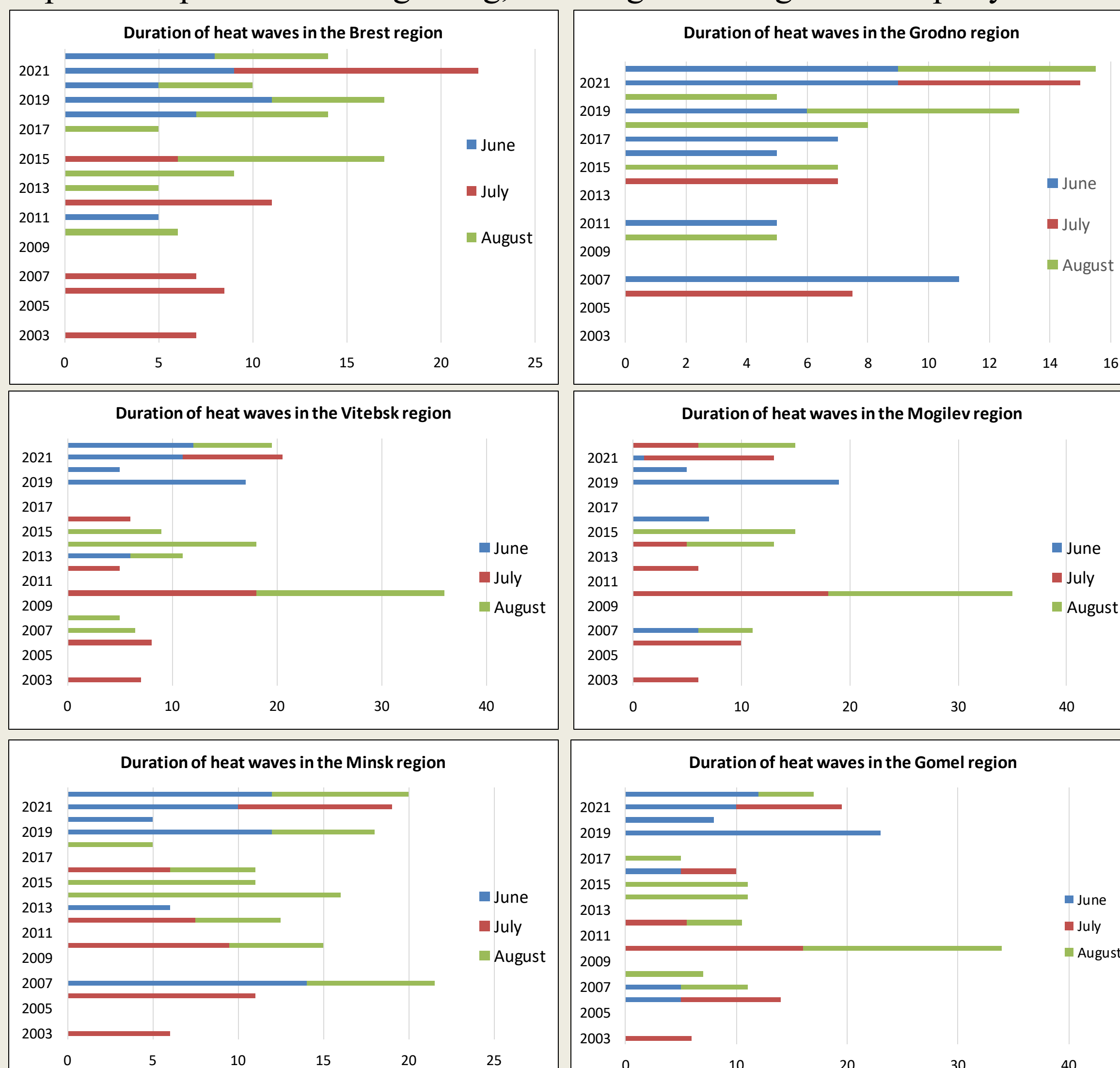
The hydrometeorological service of Belarus has adopted the following criteria for extreme high temperatures: **orange hazard level (+25...+34°C)** and **red (highest) (+35°C and above)**. A **heat wave** was defined as a period when the maximum daily air temperature for five or more consecutive days exceeded the average maximum temperature for a given day for the base period (1961-1990) by more than 5°C (by the definition of World Meteorological Organisation).

RESULTS

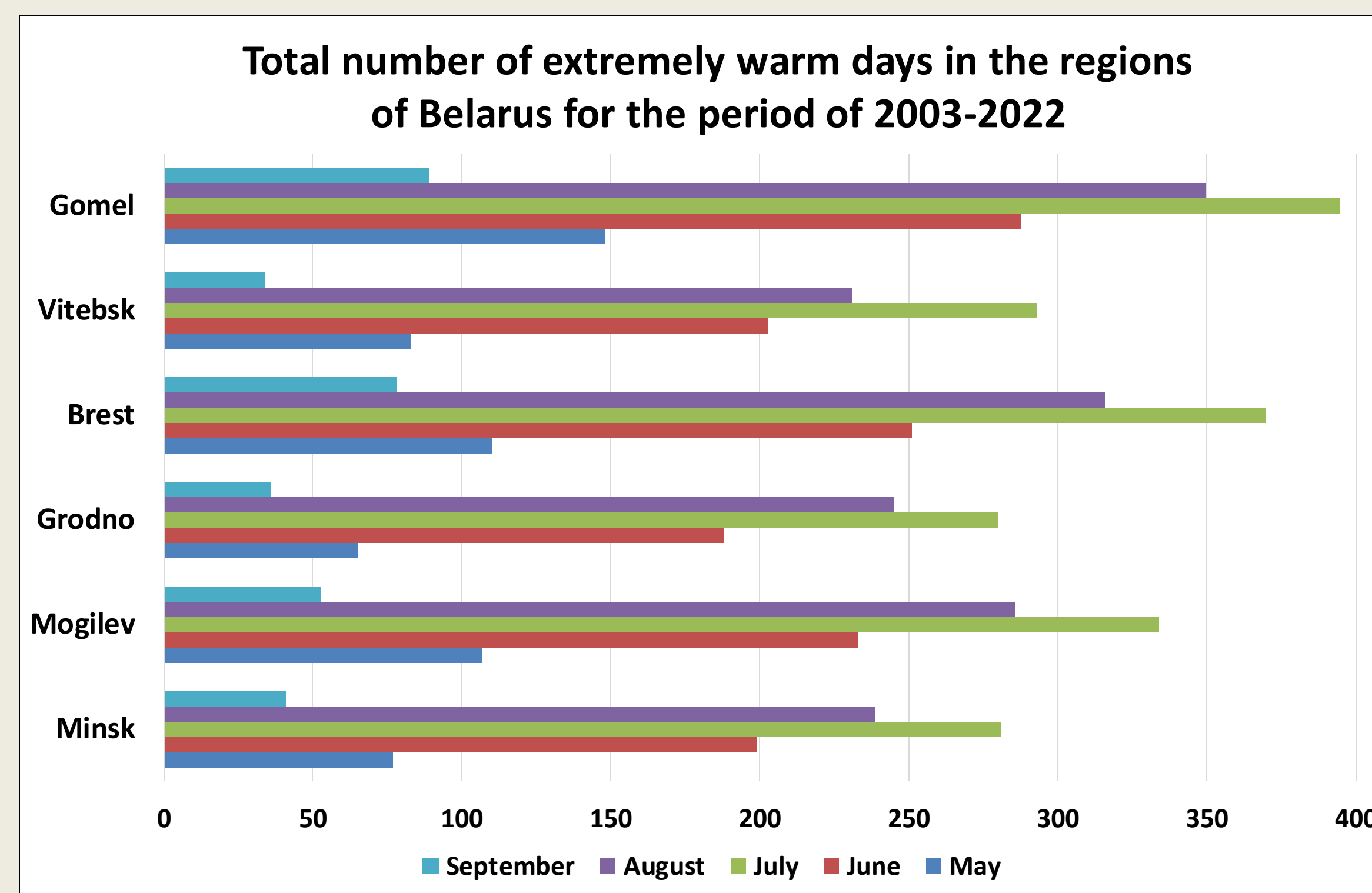
The number of heat waves, their duration and intensity increased in all regions of the country during the study period. The analysis of the frequency of **heat waves** showed that their number was **131**, the maximum was observed in the central region (*Minsk*) – **27**, the minimum – in *Mogilev* region (**17**).



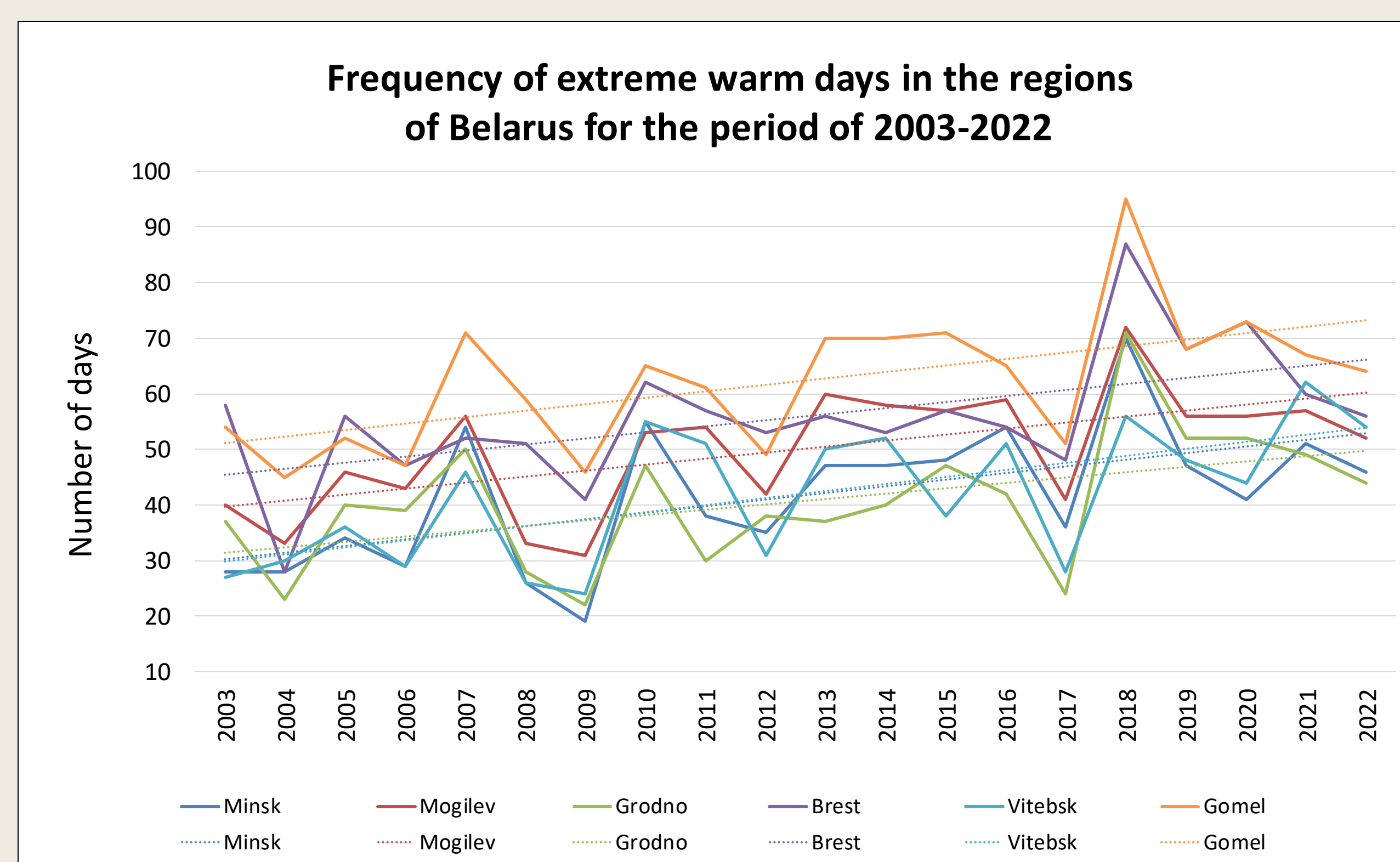
The average duration of heat waves in the country was 8 days, the longest waves were observed in June 2019 in Gomel region (23 days) and Mogilev (19 days). The frequency of heat waves at the end of the study period has tripled compared to the beginning, reaching an average 9 cases per year.



RESULTS

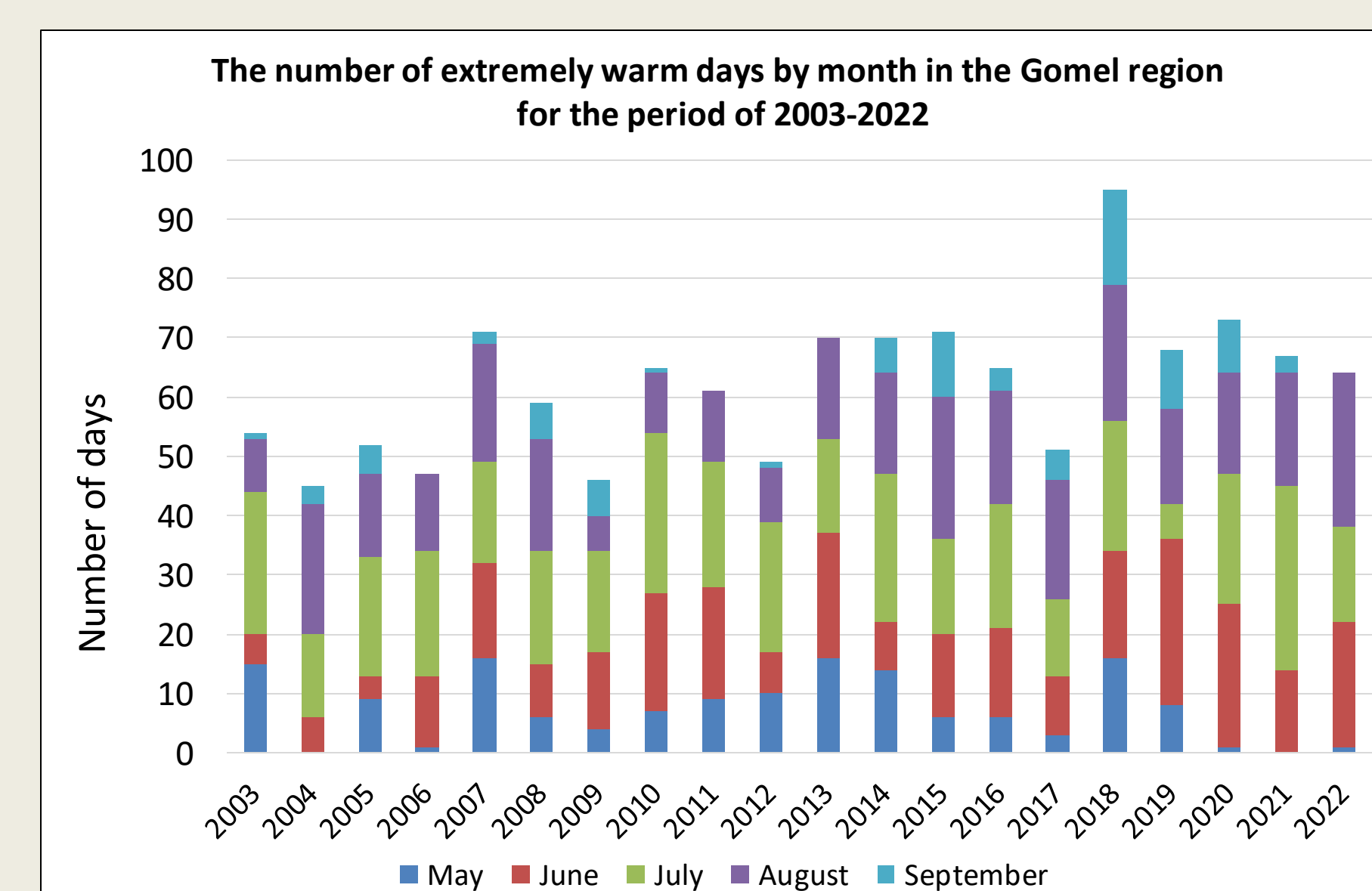
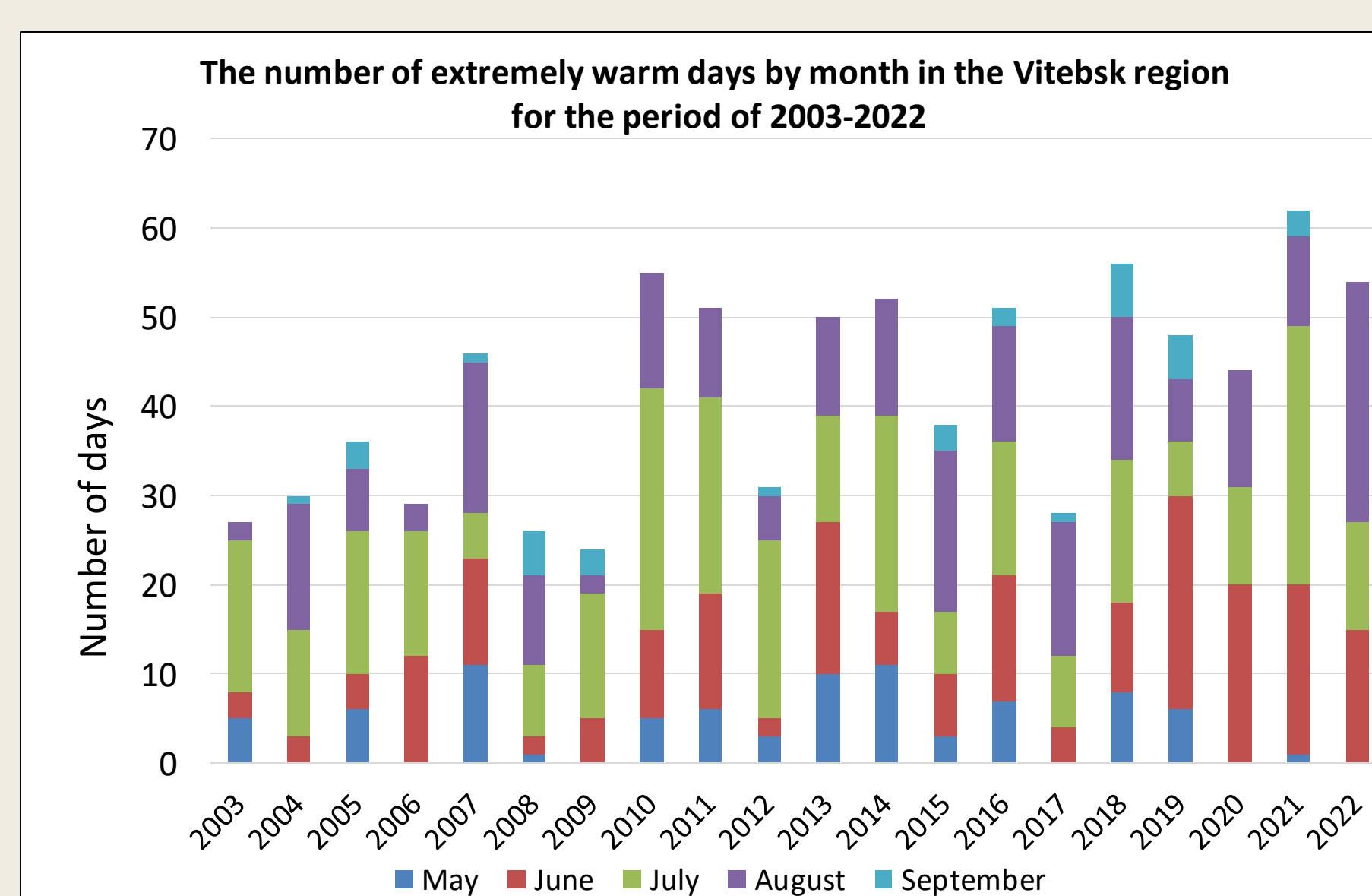
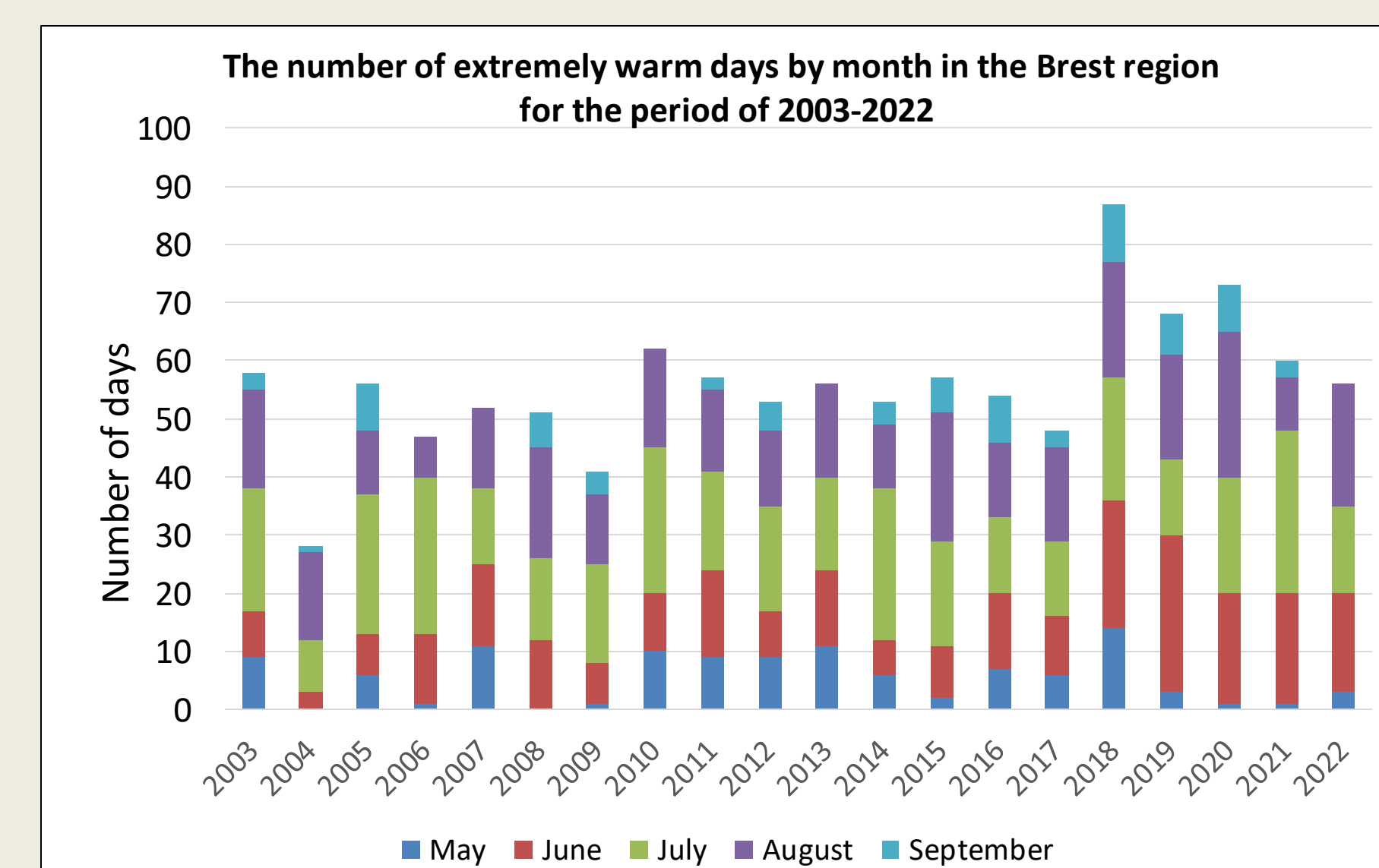
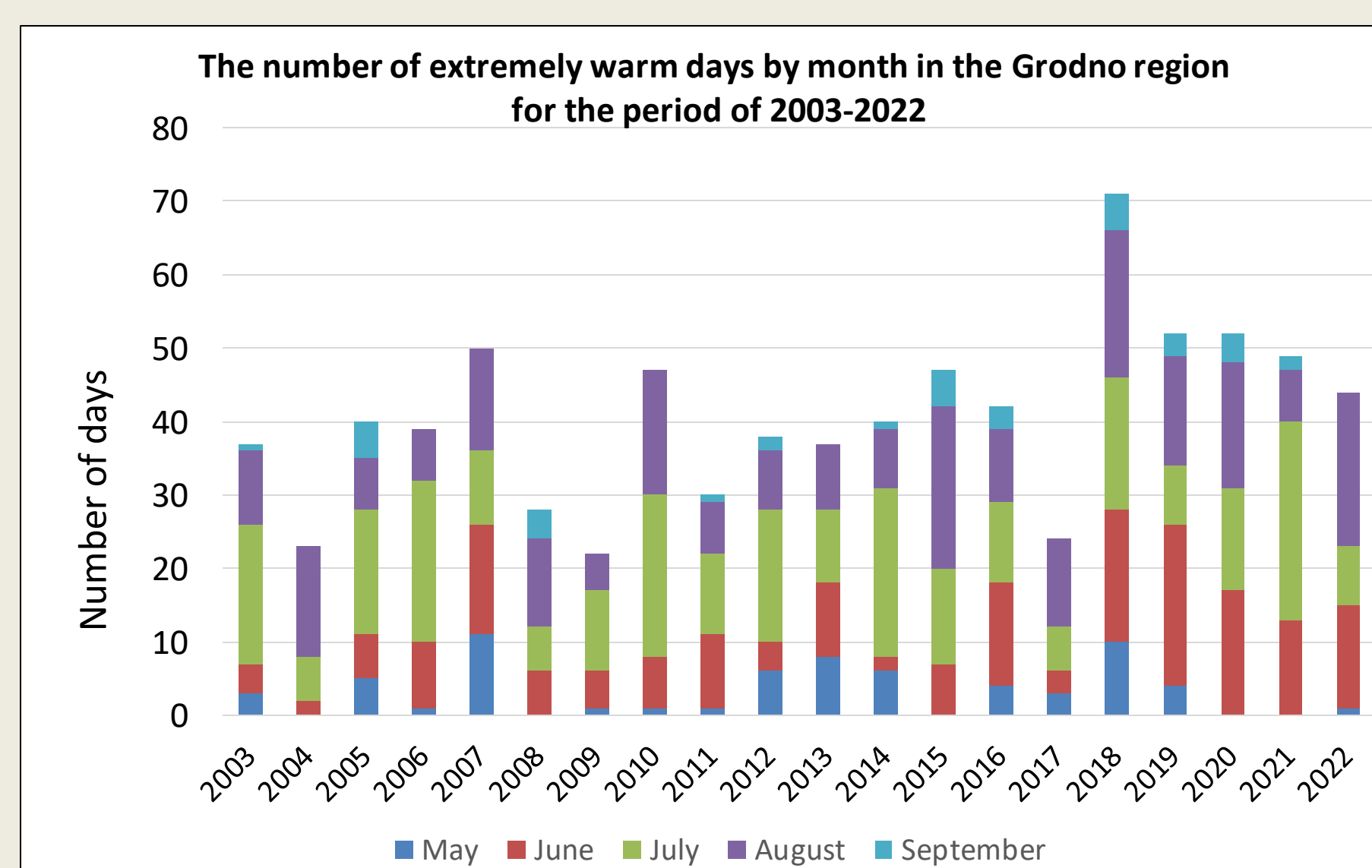
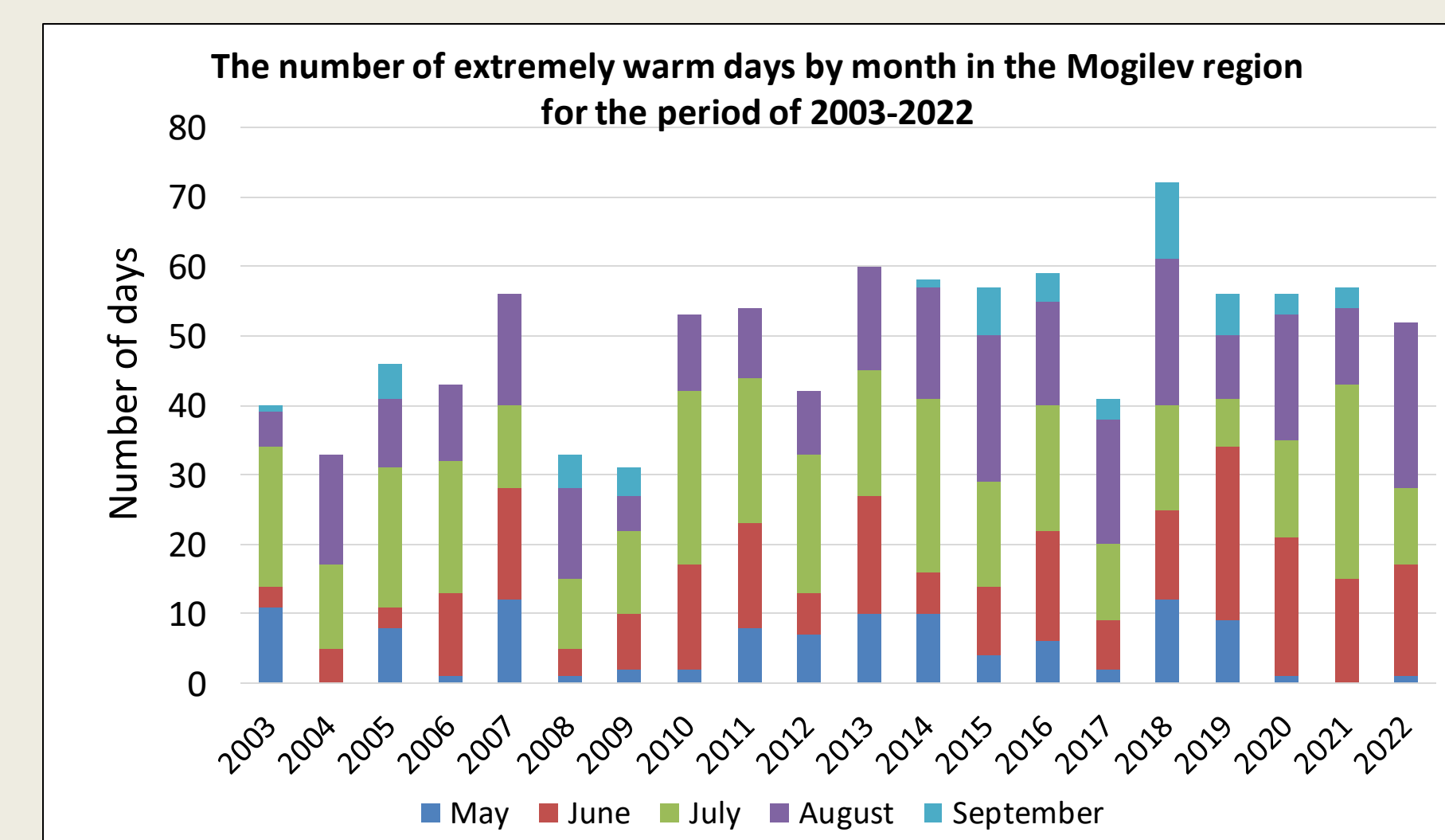
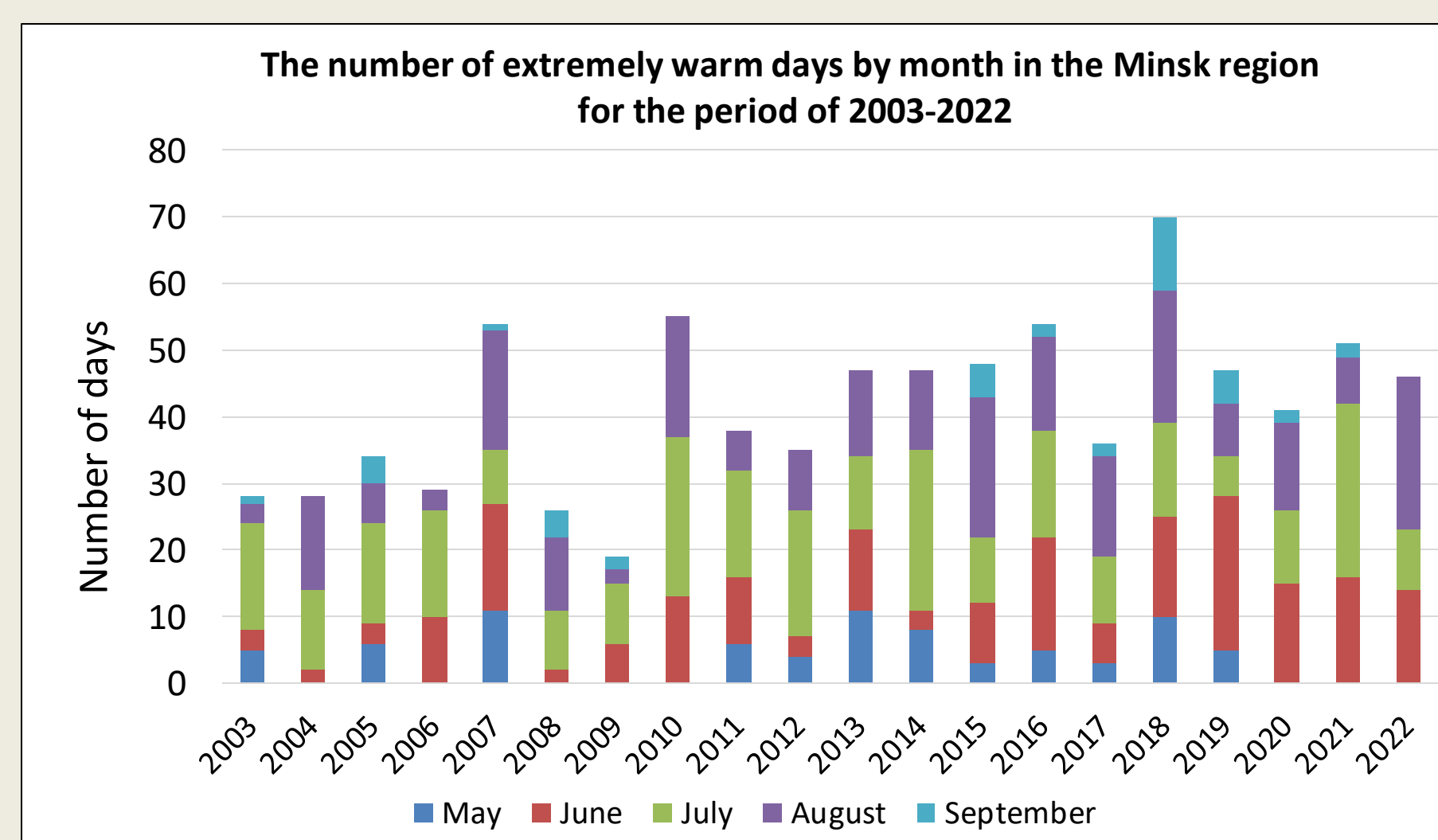


The analysis of the **total number of extremely warm days in Belarus** showed that there was a significant increase of them in all regions during the study period. A total of **5,903 extremely warm days** were recorded in all regions of the country, the number of days when the temperature reached the **orange danger level was 5842, red – 61 (1% of the total number of days)**. The maximum number of extremely warm days was observed in the southern regions of the country (*Gomel* – 1270, *Brest* – 1125), the minimum – in the north-west of the country – *Grodno* (814 days).



The number of extreme warm days has been increasing since May, reaching a maximum in July (1963 days), the minimum was in September (331 days).

In the annual distribution, the **largest total number of days with extreme temperatures** was observed in **2018** – 451 days, the minimum – in **2009** (183 days), in other years the number of days ranged from 223 to 346.



The **hottest in the history of meteorological observations** of Belarus was the **warm season of 2010** - the average air temperature for the summer season was +20.6°C, which is 3.3°C higher than the climatic norm. In August 2010, the record of the absolute maximum air temperature in Belarus was broken, which was held for 65 years - the maximum air temperature for the territory of Belarus was recorded at meteorological station *Gomel* (+38.9°C). To date, despite the frequent occurrence of intense heat waves in the summer season in subsequent years, the absolute temperature records of the summer of 2010 have not been exceeded.