The hydrogeology of the military inundation at the Yser front, 1914-1918 (Belgium)

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1 Introduction

To calculate potential evapotranspiration for grass and evaporation from open water with the Penman-Monteith approach, mean temperature $T_{\text{mean}}$ (°C), maximum temperature $T_{\text{max}}$ (°C), minimum temperature $T_{\text{min}}$ (°C), wind speed $v$ (m/s), mean relative air humidity $\text{RH}_{\text{mean}}$ (%), hours of sunshine $h_{\text{sun}}$ (h) and precipitation $P$ (mm) are needed. Unfortunately, daily parameter values are not available (any more) for the Yser area during the war years. Also, daily measurements at Brussels are not available for the first months of the war (KMI, Koninklijk Meteorologisch Instituut - Royal Meteorological Institute of Belgium, personal communication, 2014). Therefore, time series of these values (1910 to 1920) at the KNMI (Koninklijk Nederlands Meteorologisch Instituut - Royal Dutch Meteorological Institute) station De Bilt were used. However, De Bilt is located 200 km to the northeast of the study area and lays also at distance of 50 km from the coast. Consequently, differences due to the location occur and corrections are necessary.

2. Climatological data for the Yser area

For the years 2000-2004 parameter values at De Bilt were compared with those of Koksijde. This meteorological station is located on the Koksijde Air Force base, 7 km south of Nieuwpoort. Based on this comparison, a correction is determined to correct the De Bilt dataset.

Figure S1 compares the temperatures at De Bilt and Koksijde. There are slightly (about 1°C) higher mean winter temperatures at Koksijde whereas the mean summer temperatures are lower (about 2°C). There are slightly (about 1.5°C) higher minimum temperatures at Koksijde during winter whereas the minimum summer temperatures are slightly lower compared to the ones measured at De Bilt. Similar differences are found for the maximum temperatures: 1 °C higher during winter but 1 to 2 °C lower during summer. Based on these trends, a time series measured at De Bilt can be corrected to better represent a time series at Koksijde (Figure S1). The correction corresponds with a slightly milder climate near the sea for Koksijde.
Figure S1 Comparison between temperatures at De Bilt and Koksijde (blue dots) and the same comparison but with a corrected dataset at De Bilt (red dots).

Figure S2 compares the mean relative air humidity, wind velocity, hours of sun and precipitation at De Bilt and Koksijde. RHmean at Koksijde is, importantly, lower than at De Bilt and the difference increases for smaller values. Wind velocity, on the other hand, is higher at Koksijde than at De Bilt. This is also in line with the coastal location of Koksijde.

Figure S2 Comparison between mean relative air humidity, wind velocity, hours of sunshine and precipitation at De Bilt and Koksijde (blue dots) and the same comparison but with a corrected dataset at De Bilt (red dots).

However, there is no trend in the comparison of hours of sun and precipitation. This is what is expected for locations which are relatively close to each other. Contrary to the other parameters, mean
and $P$ and their trends are comparable but the specific value at a certain day is obviously not. Their daily values are not correlated. This correspondence between mean (monthly or yearly) precipitation at Koksijde and De Bilt is further illustrated in Figure S3. There is no clear trend distinguishing between these series.

![Figure S3](image3.png)

**Figure S3** Comparison between monthly and yearly precipitation at Koksijde and De Bilt.

3. October 1914

The aim of the paper is to discuss the long-term and general evolution and effects of the inundation. Therefore the specific precipitation at a given day is not important as long as the long-term mean and pattern is representative. This is displayed in Figure S3.

However, to assess the importance of rain on the success of the inundation during October 1914, it is necessary to correct the precipitation time series of De Bilt. It is known from historical sources (i.e. military reports, diaries) that a number of days with heavy rain occurred during October 1914, more precisely on 13, 19, 25, 26 and 28 October. A correction on the De Bilt time series is made by estimating the precipitation from the description in historical sources and assign a value of zero precipitation when necessary (Figure S4) for the month October 1914.

![Figure S4](image4.png)

**Figure S4** Comparison of the precipitation measured during October 1914 at De Bilt and the correction made for the location at the Yser.