in hand, this means that all the documentary data for the territory of the recent Czech Republic are put together to form single index series of temperature or precipitation. Such a summation may be less difficult for air temperature, for which high and significant positive spatial correlations are typical. In a few extreme situations, quite different temperatures can occur in the western (Bohemia) and eastern (Moravia and Silesia) parts of the Czech Republic. However, mean monthly and seasonal temperatures correlate very well, as can be demonstrated with the aid of recent instrumental measurements. Fig. 113 shows correlations of mean seasonal and annual Czech temperature series

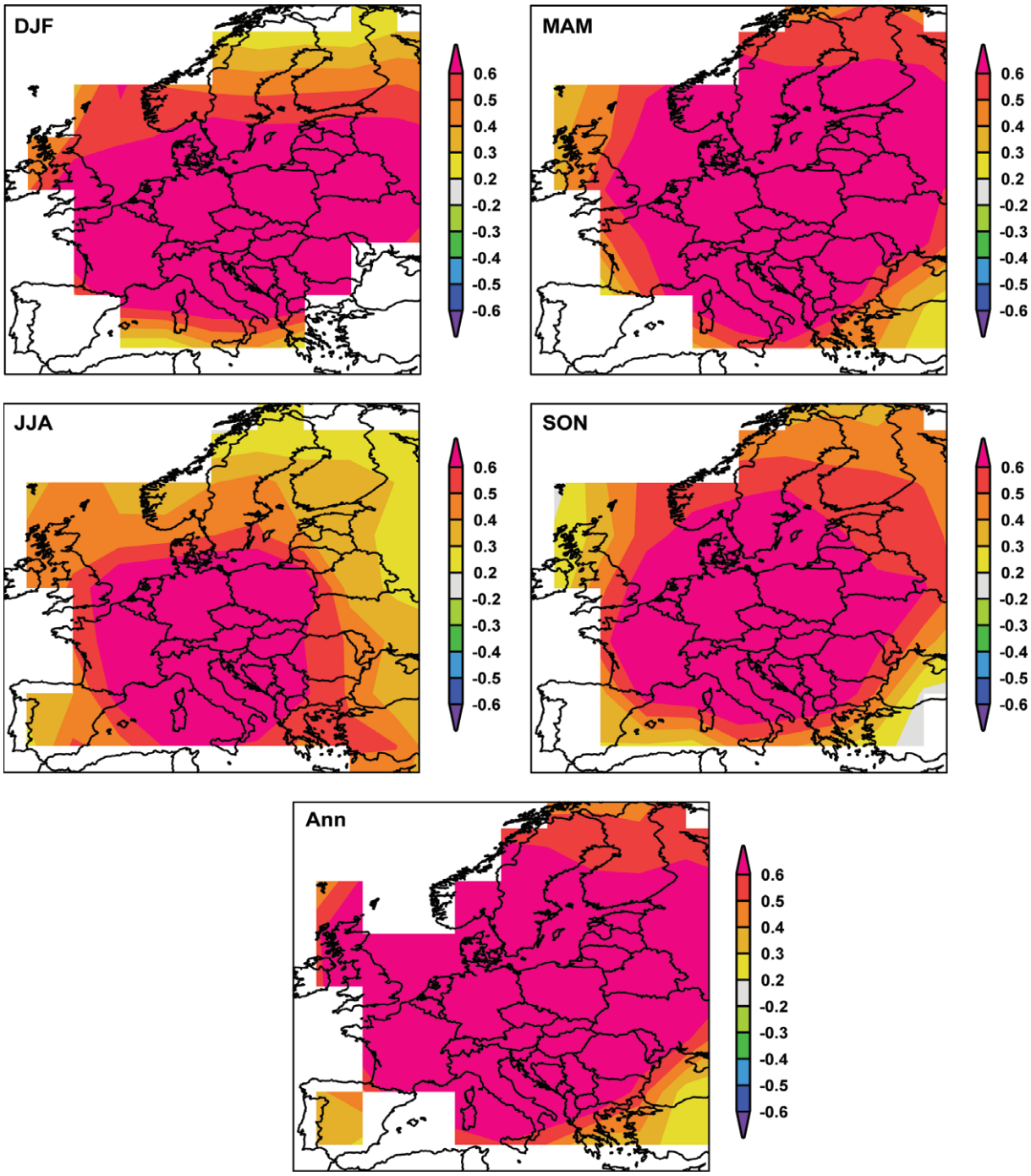

Figure 113. Spatial correlations between seasonal and annual mean Czech temperature series (Brázdil et al., 2012a) and HadCRUT4 gridded temperatures (Morice et al., 2012) for the 1850–2010 period: DJF — winter, MAM — spring, JJA — summer, SON — autumn, Ann — year

Obr. 113. Prostorové korelace průměrné sezonní a roční české teplotní řady (Brázdil et al., 2012a) s HadCRUT4 gridovými teplotami (Morice et al., 2012) v období 1850–2010: DJF — zima, MAM — jaro, JJA — léto, SON — podzim, Ann — rok

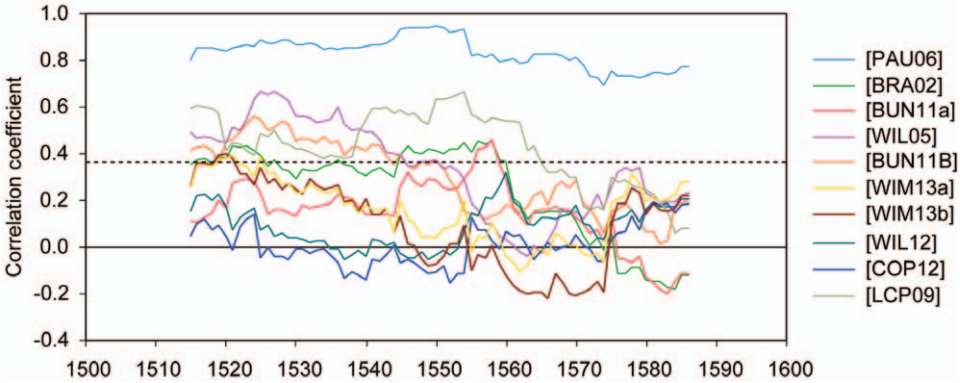

Figure 133. Running 30-year correlation coefficients of Czech [CZP13] summer precipitation series with various European reconstructions related to the summer half-year in the 16th century (see Section 4.4 for abbreviations); significant positive correlations appear above the horizontal dashed line
Obr. 133. Klouzavé 30-leté korelační koeficienty mezi letní českou srážkovou řadou [CZP13] a jinými evropskými rekonstrukcemi vztaženými k letnímu půlroku v 16. století (zkratky viz kap. 4.4); statisticky významné kladné korelace leží nad horizontální čárkovanou linií

4.5 CZECH RECONSTRUCTIONS AND THE NORTH ATLANTIC OSCILLATION

Reconstructed Czech temperature and precipitation series may be further compared to circulation patterns characterised by the North Atlantic Oscillation Index (NAOI). This is defined as a normalised sea-level pressure difference between Gibraltar, representing the Azores High, and Reykjavik, representing the Icelandic Low (see e.g. Jones et al., 1997). With positive NAOI values, the territory of the Czech Republic is influenced by westerly winds with advection of air masses from the Atlantic Ocean. This is reflected mainly in very close links between temperatures and NAOI from December to March (see e.g. Cahynová, 2005; Brázdil et al., 2009, 2012a). On the other hand, links to precipitation are much weaker, with prevailing insignificant correlations (e.g. Brázdil et al., 2009, 2012a).

Luterbacher et al. (2002) used several types of proxy data and instrumental measurement for reconstruction of seasonal values of NAOI from AD 1500. Running seasonal correlation coefficients between NAOI and reconstructed Central European temperature series are shown in Fig. 136. In similar fashion to the instrumental period, winter temperatures correlate highly with NAOI over the entire 16th century; spring temperatures show the same strong relationship to NAOI. Running correlation coefficients between NAOI and autumn temperatures are also positive, although they are more unstable over time and very low before 1530. In contrast, Central European summer temperatures

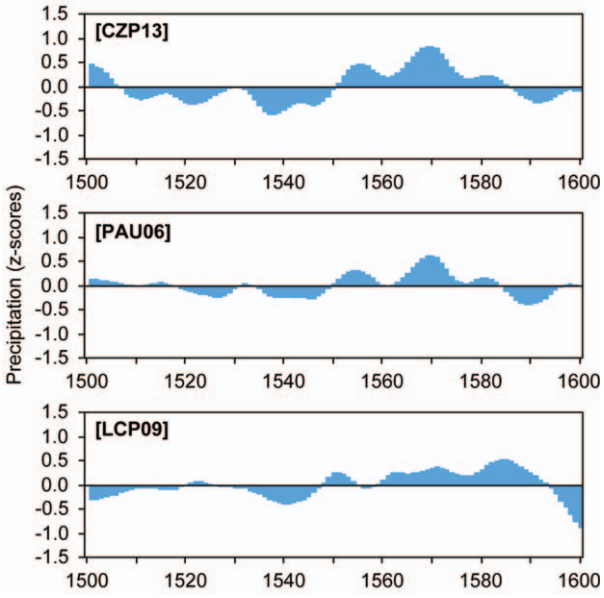

Figure 134. Fluctuations of selected European precipitation series related to the winter half-year during the 16th century (see Section 4.4 for abbreviations). All series are presented in the form of z-scores smoothed by 20-year Gaussian filter
Obr. 134. Kolísání vybraných evropských srážkových řad vztažených k zimnímu půlroku během 16. století (zkratky viz kap. 4.4). Všechny řady jsou prezentovány v podobě standardizovaných hodnot (z-skóre) shlazených 20-letým Gaussovým filtrem

and NAOI values show negative running correlation coefficients over the entire century, which are even statistically significant for the 1520s–1530s and around 1570. Negative correlations signal a decrease in temperature during strong westerlies with relatively cold airflow from the Atlantic Ocean in the summer months.

Figure 145. In "Elegia de memorabili exundatione Wltavae aliorumque Bohemiae fluviorum Anno 1598 ...", Georg Carolides z Kalsperka (1564–1612), court poet to Rudolph II, mentioned the floods that occurred on the River Vltava in March and August 1598 (Abbildungen, 1777)
Obr. 145. Jiří Karolides z Karlsperka (1564–1612), dvorní básník Rudolfa II., zachytil ve svém díle Elegia de memorabili exundatione Wltavae aliorumque Bohemiae fluviorum Anno 1598 … březnovou a srpnovou povodeň roku 1598 na Vltavě (Abbildungen, 1777)

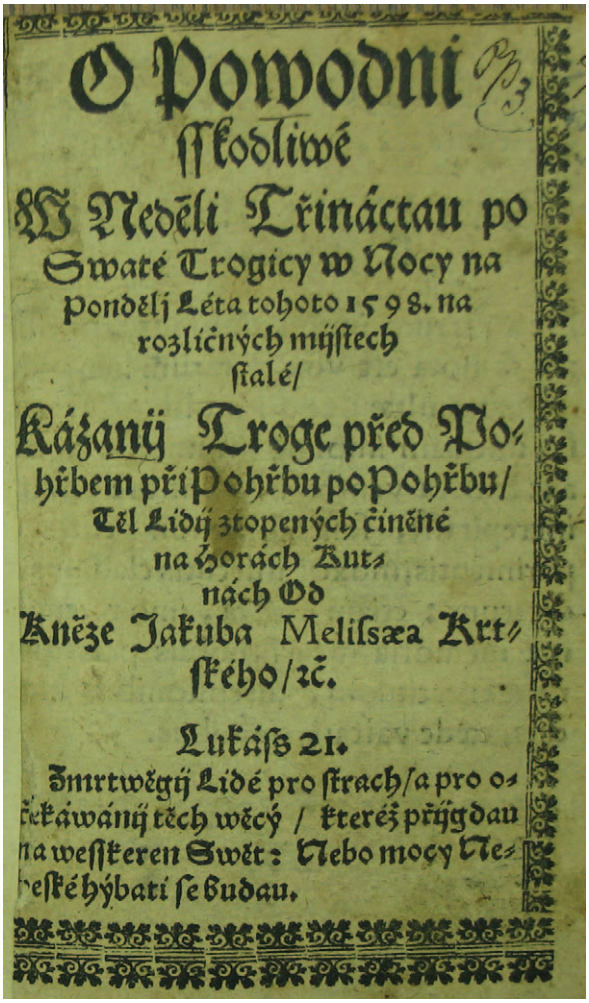
O Powodni
ſſkodliwé
W Neděli Třináctau po
Swaté Trogicy w Nocy na
Pondělj Léta tohoto 1598. na
rozličných mýſtech
ſtalé/
Kázanj Troge před Po-
hřbem při Pohřbu po Pohřbu/
Těl Lidj ztopených činěné
na horách Kut-
nách Od
Kněze Jakuba Meliſsæa Krt-
ſkého/zč.
Lukáſs 21.
Zmrtwěgj Lidé pro ſtrach/a pro o-
čekáwánj těch wěcý / kteréž přijdau
na weſſkeren Swět: Nebo mocy Ne-
beſké hýbati ſe budau.

Figure 146. The title page of a sermon published by the priest Jakub Melissaeus Krtský in connection with the funeral of those who perished during the August 1598 flood in Kutná Hora (Library of the Royal Premonstratensian canonry in Prague-Strahov, sign. FK IV 71)
Obr. 146. Titulní strana publikovaného kázání kněze Jakuba Melissaea Krtského v souvislosti s pohřbem osob, které zahynuly při povodni v srpnu roku 1598 v Kutné Hoře (Knihovna Královské kanonie premonstrátů Praha-Strahov, sign. FK IV 71)

5.1.3 The flood of August 1598

The second disastrous flood in the Czech Lands in 1598 occurred on 17–18 August in reaction to a long period of profuse precipitation, specified in *Pamětní kniha Litoměřic* (pp. 316–317) as from 25 July to 24 August. Similarly, the records for Slaný (*Kněžoveský*, p. 53) indicate that it rained for three weeks from the beginning of August onwards. Mikuláš Dačický z Heslova ascribes the flood to two days of very heavy rain combined with the breaching of overfilled fish-ponds, and goes on to refer to damage in Prague, Kouřim and Český Brod (*Dačický*, XV, p. 476). Further, he continues with a description of a tragic flood in Kutná Hora on the night of 16/17 August, which took human lives, a matter addressed in a sermon given by Jakub Melissaeus Krtský, a Kutná Hora priest (*Melissaeus* — Fig. 146).

The flood on the Vltava in Prague, together with Kutná Hora and Český Brod, is also referred to by *Kněžoveský* (p. 53). In Prague the water reached, according to Louny annalist Pavel Mikšovic, ~89 cm above the Bradáč sculpture. Further, he mentions damage in the vicinity of Kutná Hora, Litoměřice and Zbraslav (*Mikšovic*, pp. 152–153). Kutná Hora, Český Brod, and also Kouřim, appear alongside Prague in a report of the flood in the memoirs of the inhabitants of Prague's Lesser Town [*Menší Město pražské*] (*Paměti obyvatel MMP*, pp. 82–83).

the time of ripening, extreme winter frosts, late spring and early autumn frosts, torrential rain and hailstorms have the opposite effect. The occurrence of pests and diseases is also associated with certain weather patterns (Brázdil and Valášek, 2005).

The following types of information related to viticulture may be interpreted climatologically (Brázdil et al., 2008):

a) The beginning of the grape harvest (vintage)
The time at which the grape harvest begins depends on the weather patterns in the months that precede it. Warm, sunny weather contributes to an early start, while colder, rainy weather slows down the ripening of the grapes. The timing of the vintage (Fig. 172) contains proxy information on temperature patterns in the foregoing period, so systematic records of it may be used for quantitative temperature reconstruction. However, the start of the grape harvest can also be influenced by commercial decisions made by winemakers and wine merchants. For example, they might leave the grapes to ripen further in the vineyards until late autumn in an attempt to enhance the quality of the resulting wine. Furthermore, local traditions (for example, bans on vintage) and parochial festivities play an important role in the long term. A late vintage could mean that the grapes were picked in snow and frost, as in 1583 around Uherský Brod: "On the 18th day of October [i.e. 28 October in the Gregorian calendar], […] the vintage started in the Blatnice area. Then on Sunday [20 October, i.e. Gregorian 30 October] before evening, rain started, with snow, also on Monday [21 October, i.e. Gregorian 31 October] and on Tuesday [22 October, i.e. Gregorian 1 November]. […] And in the vineyards grapes were covered in snow, so they could still pick many [of them], but then on Thursday [24 October, i.e. Gregorian 3 November] intense frost [occurred] and the grapes were frozen." (*Bartoškova kron.*, p. 155).

b) Quality of wine
The quality of wine is often a reflection of the temperature and humidity patterns that precede the harvest. Grapes with a high sugar content in the "must" (grape mix before or during fermentation) correspond with warmer and drier weather at the time of ripening and a "sweet" wine. A report from Litoměřice for 1581 provides an example: "There was an abundance of wine in that year; thanks be to God, good, delicious, and clean times [i.e. clear and sunny weather] [marked] the whole summer, also during the vintage, [so] that everybody had about half more [wine] than in the previous year of 1580." (*Pamětní kniha Litoměřic*, p. 144). On the other hand, a low sugar content, a consequence of prevailing cold and rainy weather, leads to "dry", more astringent, or even sour wine.

Figure 172. A page of the Litoměřice gradual, 1517, with depiction of the Last Supper of the Lord and the vintage (State District Archives Litoměřice, Archives of the Town of Litoměřice, sign. IV C 1; photo, J. Brodský)
Obr. 172. List z litoměřického graduálu z roku 1517 s vyobrazením Poslední večeře Páně a vinobraním (Státní okresní archiv Litoměřice, fond Archiv města Litoměřice, sign. IV C 1; foto J. Brodský)

c) Quantity of wine
A bad grape harvest and subsequent lower quantity of wine may be related to the occurrence of diseases and pests (e.g. in 1588 considerable quantities of grapes were eaten by flocks of birds [fieldfares] in the Litoměřice area — *Pamětní kniha Litoměřic*, pp. 225–227), or to the negative impacts of meteorological extremes (e.g. severe winter, late spring and early autumn frosts, hail, wet summer and early autumn, etc.). A report from Židlochovice for 1598, for example, gives a clear picture: "The vintage was very bad, the grapes for the greater part rotted or did not ripen enough due to wetness