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# Analysis of late spring-summer temperatures for Western Hungary based on vine, grain tithes and harvest records

A. Kiss (1) and R. Wilson (2)

(1) University of Szeged, Physical Geography and Geoinformatics, Szeged, Hungary (kissandi@earth.geo.u-szeged.hu), (2) University of St Andrews, School of Geography and Geosciences, St Andrew, U.K. (rjsw@st-andrews.ac.uk)

In Western Hungary, phenological evidence such as the beginning of grape ripening, vine harvest, tithe collection dates and, to some extent, harvested amounts, can provide proxy based evidence for late spring-summer temperatures. These data are almost continuous from the early 17th century, with some sporadic observations from the late 16th century. Based on these historical vine and grain series, this presentation describes the current status of historical climatology in Hungary. We initially focus on town council protocols, tithe and town accounts and vine harvest dates from the town of Kőszeg (Western Hungary). The historical series correlate well, over the 18th-19th century period, with Buda May-July temperature series, the Vienna-Burgerspital series (developed by Strömmer, E. 2003), and shorter eastern Hungarian series (e.g. Kecskemét and Gyöngyös). We also present preliminary historical data from Sopron (60 km north of Kőszeg) which show the potential of extending the regional proxy information almost continuously back to the early 16th, and with sporadic data to the 15th century. The complicated nature of the data is described (e.g. with respect to the normality of the data distribution) and we present methods to transform and composite the data into homogenous, homoscedastic time-series that can be used for proxy based calibration. Finally, a preliminary May-July temperature reconstruction is described which was derived using methods commonly used in dendroclimatology. All series and analyses presented were developed within the framework of the EU project 'Millenium'.