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Ultra-High Resolution Late Holocene Temperature Reconstruction of NW Europe: Gullmar Fjord on the Swedish West Coast as a Key Climate Archive

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Gullmar Fjord is a sill fjord on the Swedish west coast, the eastern part of the epicontinental North Sea. It closely reflects the hydrography of the adjoining Skagerrak, which is characterized by water masses from the North Atlantic, North Sea and the Baltic. Gullmar Fjord is one of the worlds most investigated marine areas, hydrographical and biological studies have been performed here since the mid 19th century. Hydrographic records from the 1890s are available and since 1930 the data set has a very high temporal resolution. From terrestrial climate data around the North Sea, the North Sea region has shown to be a representative area for the North Europe climate. In addition, there are several long instrumental temperature records available from Swedish meteorological stations, which span the time from AD 1750 to present day, which we can use to calibrate proxy data with. Besides to the instrumental data sets the fjord basin is also characterized by high accumulation rates, approximately 1 cm/yr, resulting in a temporal resolution of 2-7 years. Oxygen content is generally low in the deep water but benthic foraminifera thrive. The lack of serious bioturbation together with the very small tidal activity, result in sediments and proxies that are relatively undisturbed. All together, the fjord makes up a unique site for ultra high-resolution studies of the late Holocene climate development of NW Europe. Important goals of this study are to detail the climatic responses of the well-known Roman period, Medieval Warm Epoch, the Little Ice Age and the Present. We have investigated stable oxygen and carbon isotopes in the benthic foraminifera Cassidulina laevigata from an 8.5m long piston core collected in the 120m deep Gullmar Fjord basin. Here we present results from that core, which represents the time AD 2000-500BC. Results from the analyses show

significant variations in both oxygen and carbon stable isotopes over the last c. 2500 years. The calculated bottom water temperatures from oxygen isotopes suggest higher temperatures during the Roman period, the Medieval and the Present time. The Little Ice Age appears as a significant and continuous colder period between the 14th and 19th centuries. The relative temperature variations over the last 2500 years amount to c. 2°C. Interestingly the results suggest that temperatures during the more temperate Roman, Medieval, and Present times are of the same magnitude.