

## Supplementary Material

### 1 APPROACHING THE ROMAN ECONOMY Walter Scheidel

#### SUPPLEMENT TO NOTE 28

Table 1 Cool and warm periods according to recent studies  
(Italicized years = BCE)

Location	Cool	Warm	Cool	Warm	Cool
NW Iberia	<i>975-250</i>	250-450	450-900	950-1400	1400-1850
NW Iberia	<i>100-100</i>	100-500	700-900	900-1000	1400-
SC Iberia	<i>-150</i>	<i>150-270</i>	270-900	900-1400	1400-
NW Italy		200-100		1000-1200	
NE Italy		<i>400-1</i>	450-700	700-850	
			900-1100	1150-1400	1450-1800
Switzerland	<i>1250-200</i>	200-50	50-800	800-1300	1300-1865
Switzerland	<i>450-50</i>	<i>50-100</i>		~700	
Switzerland	<i>~800</i>		~400		~1800
Austria	<i>500-300</i>	<i>300-400</i>	400-1000	1000-1600	
Georgia	<i>580-200</i>	<i>200-500</i>	500/600	650-1200	
Denmark		<i>400-400</i>	400-700	800-1350	1350-1900
Denmark		1-400			
Sweden		<i>100-100</i>	300-400	900-1000	1550-1900
Norway		1-400?	400-900	900-1550	1550-1900
Lapland		1-500?	500-900	1000	
Lapland		<i>750-1</i>		830-1260	
SW Ireland		<i>100-1</i>	400-700	~1200	1400-
Iceland		~500	~650	~1150	
Iceland		1-150	200-350	1000-1300	1350-
			650-800		
Iceland	<i>360-240</i>	230-40	~410	600-760	1380-1420
				1120-1250	
Greenland		-100	150-350		
Greenland		-150	500-900	900-1050	1200-1800
Greenland		-150			
Greenland		<i>50-100</i>		700-100	
(composite)		<i>350-400</i>			
China	<i>300-50</i>	<i>50-200</i>	450-550	900-1200	1450-1700
		300-400	750-850		
China		1-240	240-800	800-1400	1400-1820

China	~1(-200)	210-560 780-920	570-770 930-1310	1320-1910
China	200-200			
Central Asia	100-200	200-1000	1000-1200	1500-1700
Indo-Pacific	1-400?	400-950	900-1300	1550-1800

References (in order of tabulation): Desprat, Göni, and Loutre 2003; Martinez-Cortizas *et al.* 1999; Garcia *et al.* 2007; Giraudi 2009; Frisia *et al.* 2005; Holzhauser, Magny, and Zumbuhl 2005; Tinner *et al.* 2003; Chapron *et al.* 2005; Schmidt *et al.* 2008; Kvavadze and Connor 2005; Hass 1996; Rasmussen, Petersen, and Ryves 2008; Linderholm and Gunnarson 2005; Allen *et al.* 2007; Grudd *et al.* 2002; Hormes, Karlen, and Possnert 2004; McDermott, Matthey, and Hawkesworth 2001; Jiang *et al.* 2002; Sicre *et al.* 2008; Patterson *et al.* 2010; Vinther *et al.* 2006; Johnsen *et al.* 2001; Vinther *et al.* 2006; Tinner *et al.* 2003; Tan *et al.* 2003; Yang *et al.* 2002; Ge *et al.* 2003; Bao *et al.* 2004; Yang *et al.* 2009; Oppo, Rosenthal, and Linsley 2009.

See also, e.g., Alley 2000; Niggemann *et al.* 2003; Pla and Catalan 2005; Beer, Vonmoos, and Muscheler 2006; Eiriksson *et al.* 2006; Liu, Henderson, and Huang 2006; Piva *et al.* 2008.

Not all studies have produced data that support the notion of a ‘Roman Warm Period:’ for important exceptions specifically from the area of the former Roman Empire, see Mangini, Spötl, and Verdes 2005; Lebreiro *et al.* 2006; Taricco *et al.* 2009 (and cf. also Vollweiler *et al.* 2006). Even so, the use of literature in Taricco *et al.* 2009: 177-8 is misleadingly selective.

For the full range of results regarding temperature change, see Ljungqvist 2009 and 2010, much richer surveys than the better-known Mann *et al.* 2008. For the Mediterranean in particular, see also Luterbacher *et al.* forthcoming; and cf. Büntgen *et al.* 2011 on Central Europe.

There is no current synthesis of recent work on this topic. Röthlisberger 1986 and Lamb 1995 are still useful but predate much of the pertinent research. Fagan 2004 gives a wide-ranging popular account of the effects of climate on premodern history. For the Roman period, see also Heide 1997; Tainter and Crumley 2007; Hin forthcoming; and work in progress by Michael McCormick *et al.*

### SUPPLEMENT TO NOTE 30

The Roman period appears to have experienced elevated levels of precipitation on the Iberian peninsula, in North Africa and Egypt, and in the Levant. See Yakir *et al.* 1994; Besancon *et al.* 1997; Reale and Dirmeyer 2000; Reale and Shukla 2000; Migowski *et al.* 2006; Eastwood *et al.* 2007; Martin-Puertas *et al.* 2009; Leroy 2010. This weather pattern may have coincided with reduced precipitation in the central Mediterranean: see Reale and Shukla 2000; Magny *et al.* 2007; Dragoni 2008. Precipitation levels greatly fluctuated in Central Europe: Büntgen *et al.* 2011. Actual outcomes were complex. For instance, increasing precipitation and/or climatic instability in late antiquity could have negative consequences in the southern and eastern Mediterranean: see, e.g., Casana 2008; Marquer *et al.* 2008; and cf. Blundell and Barber 2005.

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