



Supplement of

IODP³ Expedition 505S “ENIGMA: Exploration Into a Global early Miocene Anomaly” Scientific Prospectus

Adam Woodhouse and Jennifer Kasbohm

Correspondence to: Adam Woodhouse (adam.woodhouse@open.ac.uk)

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Site	Chemostratigraphy	Geochronology / Volcanics	Biostratigraphy / Paleocology	Magnetostratigraphy / Magnetic susceptibility	Organic (OG) / Inorganic (IG) geochemistry	Sedimentology / XRF / Accumulation Rate (AR)
DSDP 3-15 (Maxwell et al., 1970)			PF (Blow, 1970), CN (Bukry and Bramlette, 1970)	PM (Henry and Opdyke, 1970)		
DSDP 72-516+516F (composite) (Barker et al., 1991)	Sr (Hess et al. 1989), $\delta^{18}\text{O}+\delta^{13}\text{C}$ (Woodruff and Savin, 1987; Pagani et al., 2000a)		OS (Benson and Perpouquet, 1983), CN (Berggren et al., 1983a; Persico and Villa, 2013; Plancq et al., 2013; Gennari et al., 2017), DM (Gombos, 1983), RD (Johnson, 1983), PF (Pujol, 1983; Berggren et al., 1983a; Spezzaferri and Pearson, 2009; Gennari et al., 2017), BF (Tjalsam, 1983)	PM (Berggren et al., 1983a, b; Florindo et al., 2015; Gennari et al., 2017)	OG (de Quadros et al., 1983; Pagani et al., 2000a, b; Plancq et al., 2012; Auderset et al., 2022), IG (Woodruff and Savin, 1987; Pagani et al., 2000a)	
DSDP 74-526A (Moore et al., 1983)	$\delta^{18}\text{O}+\delta^{13}\text{C}$ (Shackleton et al., 1984; Woodruff and Savin, 1987)		BF (Boersma, 1984a), PF (Boersma, 1984b), PA (Futterer, 1984), CN (Jiang and Gartner, 1984)			AR (Shackleton et al., 1984)
DSDP 82-563 (Bougault et al., 1985)	$\delta^{18}\text{O}+\delta^{13}\text{C}$ (Miller and Fairbanks, 1983, 1985; Miller et al., 1985, 1987; Abreu and Haddad, 1998), Sr (Hess et al., 1989)		CN (Parker et al., 1984; Bukry, 1985; Miller et al., 1985; Peloo-Alampay and Wei, 1995; Maiorano and Monechi, 1997, 1998; Albasrawi, 2016), OS (Coles and Whatley, 1989; Whatley and Coles, 1991), PF (Echols, 1985; Miller et al., 1985; Smart and Murray, 1991; Smart and Thomas, 2006, 2007), BF (Miller and Katz, 1987; Katz et al., 2003)	PM (Khan et al., 1985; Miller et al., 1985; Peloo-Alampay and Wei, 1995)		
DSDP 94-608 (Ruddiman et al., 1987)	Sr (Miller et al., 1991), $\delta^{18}\text{O}$ (Miller et al., 1991; Takahashi, 2004)		CN (Takayama and Sato, 1987; Baldauf et al., 1987; Gartner, 1992; Spiegler and	PM (Baldauf et al., 1987)	OG (Pagani et al., 2000a; Super et al., 2018, 2020)	

			Muller, 1992; Knapperstbusch, 2000; Plancq et al., 2013), PF (Jenkins, 1987; Baldauf et al., 1987; Miller et al., 1991; Smart and Thomas, 2006, 2007), BF (Thomas, 1986a, b, 1987; Hayward et al., 2010), BB (Spiegler and Muller, 1992)			
ODP 104-642D (Eldholm et al., 1987)	Sr (Smalley et al., 1989)	Ash (Bitschene et al., 1989), AC (Taylor and Morton, 1989; Desprairies et al., 1989)	SI (Goll, 1989; Locker and Martini, 1989; Ciesielski et al., 1989), RD (Goll and Bjorklund, 1989), BF (Goll, 1989; Osterman and Qvale, 1989), PA (Goll, 1989; Manum et al., 1989)	PM (Bleil, 1989)	OG (McDonald et al., 1989)	SED (Krissek, 1989; Froget et al., 1989; Hempel et al., 1989; Henrich et al., 1989;)
ODP 104-643A (Eldholm et al., 1987)		Ash (Bitschene et al., 1989)	SI (Goll, 1989; Ciesielski et al., 1989), CN (Eldholm et al., 1989), RD (Goll and Bjorklund, 1989), BF (Goll, 1989; Osterman and Qvale, 1989), PA (Goll, 1989; Manum et al., 1989; Sliwinska et al., 2013)	PM (Bleil, 1989)	OG (McDonald et al., 1989)	SED (Krissek, 1989; Froget et al., 1989; Hempel et al., 1989; Henrich et al., 1989; Thiede et al., 1989)
ODP 154-925A (Curry et al., 1995)	$\delta^{18}\text{O} + \delta^{13}\text{C}$ (Zachos et al., 2001; Cramer et al., 2009; Diester-Haass et al., 2009)		CN (Guitian et al., 2020), PF (Winter and Pearson, 2001)	MS (Weedon, 1997)	$\delta^{26}\text{Mg}$ (Higgins and Schrag, 2010), $\delta^{44}\text{Ca}$ (Sime et al., 2007), Nd (van Soelen et al., 2017), IG (van Soelen et al., 2017; Zhang, 2020), OG (Zhang et al., 2013; van Soelen et al., 2017)	SED (Diester-Haass et al., 2009)
ODP 154-926B (Curry et al., 1995)	$\delta^{18}\text{O} + \delta^{13}\text{C}$ (Flower et al., 1997; Paul et al., 2000; Palike et al., 2006), Sr (Flower et al., 1997; Martin et al., 1999), $\delta^7\text{Li}$ (Misra and Froelich,		CN (Raffi et al., 2016; Bergen et al., 2017; Boesiger et al., 2017; de Kaenel et al., 2017), BF (Diester-Haass et al., 2011), PF (Fraass et al., 2019)		Sr/Ca (Billups et al., 2004), $\delta^{11}\text{B}$ (Sosdian et al., 2018; Greenop et al., 2019), IG (Wheedon and Shackleton, 1997; Mawbey and Lear, 2013;	

	2012)				Stewart et al., 2017; Zhang, 2020), PF $\delta^{18}\text{O}+\delta^{13}\text{C}$ (Pearson et al., 1997; Paul et al., 2000), Nd (Stewart et al., 2016)	
ODP 154-928B (Curry et al., 1995)					IG (Zhang, 2020)	
ODP 165-998A (Sigurdsson et al., 1997)	$\delta^{18}\text{O}+\delta^{13}\text{C}$ (Clark and Totten, 2024)	Ash (Carey and Sigurdsson, 2000; Peters et al., 2000), AC (Scudder et al., 2016)	CN (Kameo and Bralower, 2000; Clark and Totten, 2024)	PM (Louvel and Bruno, 2000)	Nd (Newkirk and Martin, 2009)	
ODP 165-999A+999B (composite) (Sigurdsson et al., 1997)	$\delta^{18}\text{O}+\delta^{13}\text{C}$ (Mutti, 2000; Mutti et al., 2005)	Ash (Carey and Sigurdsson, 2000; Peters et al., 2000), AC (Scudder et al., 2016), GC (Sigurdsson et al., 2000)	CN (Kameo and Bralower, 2000; Meija-Molina et al., 2010), PF (Chaisson and D'Hondt, 2000)		IG (Frank, 2000; De Carlo and Kramer, 2000; Kramer et al., 2000)	SED (Karpoff et al., 2007)
ODP 166-1007C (Eberli et al., 1997)	$\delta^7\text{Li}$ (Dellinger et al., 2020), $\delta^{18}\text{O}+\delta^{13}\text{C}$ (Frank, 2000), $\delta^{13}\text{C}$ (Swart and Eberli, 2000)		PA (Paez-Reyes and Head, 2013; Verhoeven et al., 2014), PF (Wright and Kroon, 2000)			
IODP 390/393-U1556C (Coggon et al., 2024)						XRF (Wang et al., 2024)
IODP 390/393-U1558A (Teagle et al., 2024)						XRF (Villa et al., 2024)

Table S1: Summary of existing datasets from legacy drilling sites that will be further investigated by ENIGMA. DSDP - Deep Sea Drilling Project, ODP - Ocean Drilling Program, IODP - International Ocean Discovery Program, Sr - strontium isotopes, $\delta^{18}\text{O}$ - stable oxygen isotopes, $\delta^{13}\text{C}$ - stable carbon isotopes, $\delta^7\text{Li}$ - lithium isotopes, Ash - ash present, AC - ash chemistry, GC - geochronology, PF - planktonic foraminifera, BF - benthic foraminifera, CN - calcareous nannofossils, OS - ostracods, DM - diatoms, RD - radiolaria, SI - silicofossils, BB - bolboformids, PA - palynology, PM - paleomag, OG - organic geochemistry, IG - inorganic geochemistry, Nd - neodymium, $\delta^{26}\text{Mg}$ - magnesium isotopes, $\delta^{44}\text{Ca}$ - calcium isotopes, Sr/Ca - strontium/calcium ratios, $\delta^{11}\text{B}$ - boron isotopes.