SHORT COMMUNICATION:
Massive Erosion in Monsoonal Central India Linked to Late Holocene Landcover Degradation

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Supplementary Materials

The detrital fraction provenance was assessed using Nd isotopic ratios (Supplementary Table 1). Nd chemistry was done with conventional ion chromatography following the method of Bayon et al. (2002). Nd analyses were performed on the NEPTUNE multi-collector ICP-MS at WHOI with the internal precision of 5-10 ppm (2 sigma). The external precision, after correction to value for LaJolla standard ($^{143}Nd/^{144}Nd$=511847) is approximately 15 ppm (2 sigma). $^{143}Nd/^{144}Nd$ isotopic composition is expressed here as εNd (DePaolo and Wasserburg, 1976) units relative to ($^{143}Nd/^{144}Nd$)CHUR= 0.512638 (Hamilton et al., 1983). Very low εNd values are generally found in continental crusts, whereas higher (more positive) εNd values are commonly found in mantle-derived melts (DePaolo, 1988), such as those of large igneous provinces.

Sediment fluxes (Supplementary Table 2) were constructed as mass accumulation rates assuming negligible carbonate inputs (Johnson et al., 2014) using measured dry bulk densities on the samples used for foram radiocarbon dating and sedimentation rates from the age model of Ponton et al. (2012).

The high resolution series of bulk TOC ^{14}C content was measured at the Geological Institute and the Laboratory of Ion Beam Physics, ETH Zürich (Supplementary Table 3). The bulk TOC 14C measurements made at ETHZ are detailed in McIntyre et al. (2016). Duplicates of 70-90 mg of freeze-dried sediment samples were weighed in pre-combusted silver boats (Elementar) and fumigated with HCl to remove carbonate (Komada et al., 2008). The samples were subsequently neutralized and dried over solid NaOH pellets to remove residual acid. The samples were then wrapped in a second tinfoil boats (Elementar9 and pressed prior to analysis.

Samples were graphitized by the automated graphitization equipment (AGE) and analysed for ^{14}C using the MICADAS system (Ionplus) and an ampoule cracker system following the procedure outlined in Wacker et al. (2013). The other batch was then run as gas on the coupled EA-IRMS-AMS system at ETHZ. The data for the TOC ^{14}C content showed that samples analysed using graphite and CO_2 are within 2σ of each other (McIntyre et al., 2016).

For microscale (≤ 20 μg C) AMS ^{14}C analysis, comprehensive procedural blank assessment is critical in order to constrain analytical uncertainty (Drenzek, 2007; Santos et al., 2010; Tao et al., 2015). An evaluation of the complete procedure used here (chemical extraction, derivatization, PCGC isolation, final clean-up and combustion steps) yielded a procedural blank of 1.2±0.4 μg C per 30 PCGC injections, with an $\Delta^{14}C$ of –382±126‰ (Tao et al., 2015). Separate assessment of modern and fossil C blanks yielded 0.8±0.2 μg of modern C contamination (i.e., $\Delta^{14}C$ = 0‰) and 0.5 ± 0.1 μg of dead C contamination (i.e., $\Delta^{14}C$ = –1000‰), with a combined procedural blank of 1.3±0.2 μg

C per PCGC 30 injections with a $\Delta^{14}C$ value of –325±129‰. From this assessment as well as a previous assessment (Drenzek, 2007), we estimate that the analytical uncertainty for ^{14}C analysis of FAs ranges from 6 to 40‰ (ave., 12‰).

The raw and calibrated radiocarbon age models used to estimate depositional ages are from Ponton et al. (2012). The age of the bulk TOC at the time of their deposition was estimated by taking the offsets between their radiocarbon content and the interpolated reservoir-corrected foraminifera-based radiocarbon age (Supplementary Table 3). The reservoir correction used was 400 years. Taking a conservative approach we calculated the propagated error for the radiocarbon age offsets (Supplementary Table 3) as:

$$err.\ offset = ((err.\ TOC\ ^{14}C\ measurement)^2 + (max.\ err.\ foram\ ^{14}C\ measurement)^2)^{1/2}$$

where the maximum error for the foraminifera ^{14}C measurements used in the age model was 55 ^{14}C years (Ponton et al., 2012). The resulting errors for the offset range between 63 and 80 years.

Supplementary Table 1. Downcore measurements of $^{143}Nd/^{144}Nd$ composition with corresponding εNd for the Holocene section of NGHP-01-16A in front of Godavari delta.

Depth (mbsf)	**Age** (kyr)	**143Nd/144Nd**	**εNd**
0.00	59	0.511999	-12.46
0.16	159	0.511973	-12.97
0.32	256	0.512035	-11.76
0.80	542	0.511946	-13.50
1.70	1085	0.512018	-12.09
2.50	1627	0.511945	-13.52
3.00	2019	0.511888	-14.63
3.60	2567	0.511888	-14.63
4.00	2990	0.511830	-15.76
4.80	4002	0.511780	-16.74
5.40	4936	0.511809	-16.17
6.00	6043	0.511847	-15.43
6.50	7116	0.511856	-15.25
6.90	8082	0.511832	-15.72
7.20	8873	0.511801	-16.33
7.60	10024	0.511822	-15.92

Supplementary Table 2. Downcore estimates of sediment fluxes for the Holocene section of NGHP-01-16A in front of Godavari delta based on calibrated foraminifera ^{14}C depositional ages.

Depth (mbsf)	**Age** (kyr)	**Sediment Flux** ($g/cm^2/kyr$)
0.075	0	87.0
1.475	1104	151.2
2.975	1852	70.7
4.045	2895	47.8
4.775	4046	41.8
5.355	5331	49.2
6.015	5996	31.0
6.435	6198	31.0
7.215	9056	23.7
7.655	10314	23.7
7.885	10619	25.8

Supplementary Table 2. Downcore measurements of bulk TOC measured at ETH and offsets to foram ^{14}C depositional ages for the Holocene section of NGHP-01-16A.

Depth (mbsf)	Age (kyr)	^{14}C Depositional Age (kyr)	^{14}C Age (kyr)	Error ^{14}C Age (kyr)	^{14}C Age Offset (kyr)	Max. Error ^{14}C Age Offset (kyr)
0.265	223	31	1844	51	1813	75
0.350	274	117	1928	32	1811	63
0.440	328	205	1833	32	1627	63
0.485	355	249	1869	32	1620	63
0.545	391	305	1924	51	1619	75
0.660	459	410	1948	51	1538	75
0.755	516	494	2098	51	1604	75
0.840	566	567	2206	51	1639	75
0.890	595	609	2251	32	1642	63
0.940	625	650	2238	32	1588	64
1.035	681	726	2246	51	1519	75
1.085	711	766	2389	51	1623	75
1.145	746	812	2306	32	1494	64
1.235	800	881	2233	32	1352	64
1.305	842	933	2421	51	1488	75
1.635	1044	1166	2709	33	1542	64
1.825	1164	1293	2712	52	1419	75
1.865	1190	1320	2673	32	1354	64
2.060	1318	1446	2783	32	1337	64
2.315	1493	1607	2850	52	1243	76
2.365	1529	1638	2837	32	1198	64
2.640	1732	1811	3069	52	1258	76
2.835	1884	1935	3033	52	1098	76
3.090	2096	2100	3327	52	1227	76
3.315	2295	2253	3353	32	1101	64
3.365	2341	2287	3364	52	1077	76
3.560	2528	2427	3466	32	1039	64
3.855	2831	2652	3835	33	1183	64
3.915	2896	2700	3842	53	1142	76
4.085	3086	2842	3902	53	1060	76
4.130	3138	2881	3882	52	1001	76
4.310	3354	3042	4086	33	1044	64
4.575	3693	3299	4386	53	1088	76
4.745	3925	3476	4590	54	1114	77
4.965	4243	3723	4871	34	1148	65
5.140	4511	3934	5063	34	1129	65
5.180	4574	3984	5141	33	1157	64
5.355	4860	4213	5085	54	872	77
5.655	5384	4640	5301	34	661	65
5.865	5778	4969	5702	34	733	65
6.165	6382	5482	6063	34	581	65
6.200	6455	5546	6210	55	664	78
6.575	7290	6278	6704	56	427	78
6.605	7360	6340	6810	35	470	65
6.825	7893	6820	7218	56	399	79
6.860	7981	6899	7208	35	308	65
7.065	8510	7384	8276	58	892	80

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