Processed File Index *_RawCurated.nc & *_Processed.nc

Global Metadata

The attributes included are the same for both *Processed.nc and *RawCurated.nc files, except for Data_Citation_Dataset and DOI which are specific to the respective repositories for the two file types. Most of these values are animal- and deployment-specific and are intended to provide the user with the metadata needed to appropriately use the file contents.

Attribute	Contents
File_Creation_Date	
File_MATLAB_Version	
File_R_Version	
File_aniMotum_Version	
File_IKNOS_DA-ZOC_Version	
File_Contents	Brief description of the data contained in the file (specific to file type)
Data_Owner	Daniel Costa
Data_Public	Yes: data can be used freely as long as data owner is properly cited. We strongly recommend reaching out to the data owner or another of the coauthors (D.Crocker, R.Holser, P.Robinson) for additional information about the study system. Offers of co-authorship would be appreciated, especially given the unique natural history of this organism and the considerable effort required to collect these data.
Data_Citation_Paper	
Data_Citation_Paper_DOI	
Data_Citation_Dataset	Costa, Daniel et al. (2023), Northern Elephant Seal Tracking and Diving Data - Processed, Dryad, Dataset, https://doi.org/10.7291/D18D7W
Data_Citation_Dataset_DOI	10.7291/D18D7W
Data_Type	Tracking and diving time-series
Data_Assembly_By	UCSC/Rachel Holser
Data_Timezome	UTC
Animal_ID	Unique animal identifier
Animal_Species	
Animal_Species_CommonName	
Animal_Sex	M/F
Animal_AgeClass	Adult, Juvenile, etc.
Animal_BirthYear	Year of birth if known; breeding season includes Dec – Feb; all animals born in a breeding season are assigned the year that starts Jan 1st.
Animal_HadPup	Y/N for PM animals (gestational trip); N/A for PB animals (pre-implantation)
Animal_OtherDeployments	List of all TOPPIDs (Deployment_ID) for this unique animal
Deployment_ID	TOPPID - Unique trip identifier for this file
Deployment_Year	
Deployment_Season	PB/PM; post-breeding or post-molting trips
Deployment_InstrumentsRecovered?	Y/N
Deployment_Manipulation?	Y/N; were animals additionally manipulated with the intention of altering behavior?

Processed File Index

Attribute	Contents
Deployment_Departure_Location	Four-letter colony code (ANNU – Año Nuevo; GUAD – Isla Guadalupe; GORD – Gorda; PIBL – Piedras Blancas; PTRE – Point Reyes; SABE – Isla San Benito; SEFI – Southeast Farallon Island; SHIS – Shell Island; SNIS – San Nicholas Island; SMIS – San Miguel Island)
Deployment_Departure_Lat	
Deployment_Departure_Lon	
Deployment_Departure_Datetime	UTC
Deployment_Arrival_Location	Four-letter colony code (see above)
Deployment_Arrival_Lat	
Deployment_Arrival_Lon	
Deployment_Arrival_Datetime	UTC
Data_Track_QCFlag	Index of quality from 1-5. 1: Complete Data; 2: Mostly Complete Data; 3: Incomplete Data; 4: Questionable Data; 5: No Data. See table on page 3 for detailed definitions of these qualities.
Data_TDR1_QCFlag	
Data_TDR2_QCFlag	
Data_TDR3_QCFlag	
Data_TDR1_SamplingFrequency_Hz	
Data_TDR1_DepthResolution_m	
Data_TDR2_SamplingFrequency_Hz	
Data_TDR2_DepthResolution_m	
Data_TDR3_SamplingFrequency_Hz	
Data_TDR3_DepthResolution_m	
Tags_SatTag_Manufacturer	
Tags_SatTag_Model	
Tags_SatTag_ID	
Tags_PTT	
Tags_TDR1_Tag_Manufacturer	
Tags_TDR1_Tag_Model	
Tags_TDR1_Tag_ID	
Tags_TDR1_Comments	
Tags_TDR2_Tag_Manufacturer	
Tags_TDR2_Tag_Model	
Tags_TDR2_Tag_ID	
Tags_TDR2_Comments	
Tags_TDR3_Tag_Manufacturer	
Tags_TDR3_Tag_Model	
Tags_TDR3_Tag_ID	
Tags_TDR3_Comments	

<u>Quality Control Flag Definitions</u>

These QC flags are used in netCDF files for both tracking and diving data in both RawCurated and Processed data files. Tracking data and dive records each receive a separate QC flag.

QC Flag	Meaning	Definition - Tracks	Definition - Dive Records
1	Complete Data	Tracks are complete. No gaps >24 hrs between locations AND at least 2 locations/day on average.	Dive records are complete, with no data gaps, AND no indications of instrument malfunction.
2	Mostly Complete Data	Tracking data have one or more data gaps of up to 2 consecutive days; AND at least 2 locations/day on average.	Dive records have one or more data gaps of up to 2 days; OR data show minor indications of instrument malfunction.
3	Incomplete Data	Tracks have one or more data gaps greater than 2 consecutive days; AND at least 2 locations/day on average across data collection period (i.e., if tag died, not counting those days).	Dive records have one or more gaps greater than 2 consecutive days.
4	Questionable Data	Tracks have sparse data (<2 locations/day on average).	Dive records have substantial indications of instrument failure.
5	No Data	No GPS or Argos locations are available.	No dive records are available.

Raw/Curated File Index

*_TrackTDR_RawCurated.nc

Group and Variable Metadata

Index of groups and variables contained in level netCDF files (*_TrackTDR_RawCurated.nc). These files contain the raw and zero-offset corrected full-resolution time-depth records, raw Argos and GPS location estimates, and combined location estimates prepared for aniMotum processing.

Group	Variable	Description	Units
RAW_ARGOS	**Group contains raw argos data**		
RAW_ARGOS	PTT	PTT of satellite tag	
RAW_ARGOS	DATE	Date of Argos-based location estimate	UTC
RAW_ARGOS	CLASS	Location class of Argos-based location estimate	
RAW_ARGOS	LAT	Latitude of Argos-based location estimate	decimal degrees
RAW_ARGOS	LON	Longitude of Argos-based location estimate	decimal degrees
RAW_ARGOS	SEMIMAJOR	Semi-major axis of location estimate's error ellipse	
RAW_ARGOS	SEMIMINOR	Semi-minor axis of location estimate's error ellipse	
RAW_ARGOS	EOR	Semi-major axis orientation from north	
RAW_GPS	**Group contains raw GPS data**		
RAW_GPS	DATE	Date of GPS-based location estimate	
RAW_GPS	TIME	Time of GPS-based location estimate	UTC
RAW_GPS	NUM_SATELLITES	Number of GPS satellites detected for location estimate	
RAW_GPS	LAT	Latitude of GPS-based location estimate	decimal degrees
RAW_GPS	LON	Longitude of GPS-based location estimate	decimal degrees
RAW_TDRs	**Group contains raw time-depth records**		
RAW_TDR1	DATE		
RAW_TDR1	DEPTH	Uncorrected depth	M
RAW_TDR2	DATE		
RAW_TDR2	DEPTH	Uncorrected depth	M
RAW_TDR3	DATE		
RAW_TDR3	DEPTH	Uncorrected depth	M
CURATED_LOCATIONS	**Group contains combined Argos and GPS data, trimmed to time at sea**		
CURATED_LOCATIONS	DATE	Date and time of location estimate	UTC
CURATED_LOCATIONS	LAT	Latitude of location estimate	decimal degrees
CURATED_LOCATIONS	LON	Longitude of location estimate	decimal degrees
CURATED_LOCATIONS	LOC_CLASS	Location class of location estimate	
CURATED_LOCATIONS	SEMI_MAJ_AXIS	Semi-major axis of location estimate's error ellipse	

Raw/Curated File Index *_TrackTDR_RawCurated.nc

Group	Variable	Description	Units
CURATED_LOCATIONS	SEMI_MIN_AXIS	Semi-minor axis of location estimate's error ellipse	
CURATED_LOCATIONS	ELLIPSE_ORIENTATION	Semi-major axis orientation from north	
CLEAN_ZOC_TDRs	**Groups contain uncorrected and zero-offset corrected depth records**		
CLEAN_ZOC_TDR1	DATE	MATLAB serial date	UTC
CLEAN_ZOC_TDR1	CORR_DEPTH	Depth corrected for true surface	m
CLEAN_ZOC_TDR1	DEPTH	Uncorrected depth	m
CLEAN_ZOC_TDR2	DATE	MATLAB serial date	UTC
CLEAN_ZOC_TDR2	CORR_DEPTH	Depth corrected for true surface	m
CLEAN_ZOC_TDR2	DEPTH	Uncorrected depth	m
CLEAN_ZOC_TDR3	DATE	MATLAB serial date	UTC
CLEAN_ZOC_TDR3	CORR_DEPTH	Depth corrected for true surface	m
CLEAN_ZOC_TDR3	DEPTH	Uncorrected depth	m

Quality Control Flags

Group and Variable Metadata

Index of groups/variables contained in processed netCDF files (*_TrackTDR_Processed.nc). These files contain the aniMotum processed tracking data and the dive statistics from each TDR the animal carried (up to 3). Dive statistics were calculated for both full records (e.g., TDR1) and depth data subsampled to every 8 seconds the full record had a sampling frequency every 1, 2, or 4 s (TDR1_8S). Sampling frequencies are included in global attributes (see S2).

Group	Variable	Description	Units
TRACK	**Group contains the output from aniMotum-processing tracking data**		
TRACK	LAT	AniMotum track latitude	decimal degrees
TRACK	LON	AniMotum track longitude	decimal degrees
TRACK	DATE	Date and time of location estimate	UTC
TRACK	X	AniMotum interpolated location estimate longitude, World Mercator Projection	km
TRACK	Y	AniMotum interpolated location estimate latitude, World Mercator Projection	km
TRACK	X_SE	AniMotum interpolated location estimate standard error in longitude	km
TRACK	Y_SE	AniMotum interpolated location estimate standard error in latitude	km
TRACK	U	AniMotum estimated velocity in x direction	m/s
TRACK	V	AniMotum estimated velocity in y direction	m/s
TRACK	U_SE	AniMotum estimated standard error of velocity in x direction	m/s
TRACK	V_SE	AniMotum estimated standard error of velocity in y direction	m/s
TRACK	S	AniMotum estimated directionless velocity	m/s
TDR1	**Group contains dive statistics and locations for the primary TDR at full resolution**		
TDR1	DATE	Date time at start of dive (UTC)	UTC
TDR1	MAXDEPTH	Max depth recorded during dive	m
TDR1	DURATION	Total duration of dive	sec
TDR1	DESC_TIME	Time spent in descent phase	sec
TDR1	BOTT_TIME	Time spent in bottom phase	sec
TDR1	ASC_TIME	Time spent in ascent phase	sec
TDR1	DESC_RATE	Average rate of descent	m/sec
TDR1	ASC_RATE	Average rate of ascent	m/sec
TDR1	PDI	Surface time after dive	sec
TDR1	WIGGLES_DESC	# of vertical inflections during descent	count
TDR1	WIGGLES_BOTT	# of vertical inflections during bottom	count
TDR1	WIGGLES_ASC	# of vertical inflections during ascent	count

Quality Control Flags

Group	Variable	Description	Units
TDR1	TOT_VERT_DIST_BOTT	Sum of all depth changes during bottom	m
TDR1	BOTT_RANGE	Max-min depth of bottom phase	m
TDR1	EFFICIENCY	Ratio of bottom time to dive cycle	
TDR1	IDZ	Binary indicator of whether max depth is within 20% of previous dive's max depth	
TDR1	SOLAR_EL	Angle of sun relative to horizon	degrees
TDR1	LAT	Decimal latitude at start of dive	decimal degrees
TDR1	LON	Decimal longitude at start of dive	decimal degrees
TDR1	LAT_SE_KM	Latitude error	km
TDR1	LON_SE_KM	Longitude error	km
TDR1	YEAR	Year at start of dive	
TDR1	MONTH	Month at start of dive	
TDR1	DAY	Day at start of dive	
TDR1	HOUR	Hour at start of dive	
TDR1	MIN	Minute at start of dive	
TDR1	SEC	Second at start of dive	
TDR1_8S	**Group contains dive statistics and locations for primary TDR at 8 s (subsampled or full-res)**		
TDR1_8S	DATE	Date time at start of dive	UTC
TDR1_8S	MAXDEPTH	Max depth recorded during dive	m
TDR1_8S	DURATION	Total duration of dive	sec
TDR1_8S	DESC_TIME	Time spent in descent phase	sec
TDR1_8S	BOTT_TIME	Time spent in bottom phase	sec
TDR1_8S	ASC_TIME	Time spent in ascent phase	sec
TDR1_8S	DESC_RATE	Average rate of descent	m/sec
TDR1_8S	ASC_RATE	Average rate of ascent	m/sec
TDR1_8S	PDI	Surface time after dive	sec
TDR1_8S	WIGGLES_DESC	# of vertical inflections during descent	count
TDR1_8S	WIGGLES_BOTT	# of vertical inflections during bottom	count
TDR1_8S	WIGGLES_ASC	# of vertical inflections during ascent	count
TDR1_8S	TOT_VERT_DIST_BOTT	Sum of all depth changes during bottom	m
TDR1_8S	BOTT_RANGE	Max-min depth of bottom phase	m
TDR1_8S	EFFICIENCY	Ratio of bottom time to dive cycle	
TDR1_8S	IDZ	Binary indicator of whether max depth is within 20% of previous dive's max depth	
TDR1_8S	SOLAR_EL	Angle of sun relative to horizon	degrees

Quality Control Flags

Group	Variable	Description	Units
TDR1_8S	LAT	Decimal latitude at start of dive	decimal degrees
TDR1_8S	LON	Decimal longitude at start of dive	decimal degrees
TDR1_8S	LAT_SE_KM	Latitude error	km
TDR1_8S	LON_SE_KM	Longitude error	km
TDR1_8S	YEAR	Year at start of dive	
TDR1_8S	MONTH	Month at start of dive	
TDR1_8S	DAY	Day at start of dive	
TDR1_8S	HOUR	Hour at start of dive	
TDR1_8S	MIN	Minute at start of dive	
TDR1_8S	SEC	Second at start of dive	
TDR2	**Group contains dive statistics and locations for the second TDR at full resolution**		
TDR2	DATE	Date time at start of dive	UTC
TDR2	MAXDEPTH	Max depth recorded during dive	m
TDR2	DURATION	Total duration of dive	sec
TDR2	DESC_TIME	Time spent in descent phase	sec
TDR2	BOTT_TIME	Time spent in bottom phase	sec
TDR2	ASC_TIME	Time spent in ascent phase	sec
TDR2	DESC_RATE	Average rate of descent	m/sec
TDR2	ASC_RATE	Average rate of ascent	m/sec
TDR2	PDI	Surface time after dive	sec
TDR2	WIGGLES_DESC	# of vertical inflections during descent	count
TDR2	WIGGLES_BOTT	# of vertical inflections during bottom	count
TDR2	WIGGLES_ASC	# of vertical inflections during ascent	count
TDR2	TOT_VERT_DIST_BOTT	Sum of all depth changes during bottom	m
TDR2	BOTT_RANGE	Max-min depth of bottom phase	m
TDR2	EFFICIENCY	Ratio of bottom time to dive cycle	
TDR2	IDZ	Binary indicator of whether max depth is within 20% of previous dive's max depth	
TDR2	SOLAR_EL	Angle of sun relative to horizon	degrees
TDR2	LAT	Decimal latitude at start of dive	decimal degrees
TDR2	LON	Decimal longitude at start of dive	decimal degrees
TDR2	LAT_SE_KM	Latitude error	km
TDR2	LON_SE_KM	Longitude error	km
TDR2	YEAR	Year at start of dive	
TDR2	MONTH	Month at start of dive	

Quality Control Flags

Group	Variable	Description	Units
TDR2	DAY	Day at start of dive	
TDR2	HOUR	Hour at start of dive	
TDR2	MIN	Minute at start of dive	
TDR2	SEC	Second at start of dive	
TDR2_8S	**Group contains dive statistics and locations for second TDR at 8 s (subsampled or full-res)**		
TDR2_8S	DATE	Date time at start of dive	UTC
TDR2_8S	MAXDEPTH	Max depth recorded during dive	m
TDR2_8S	DURATION	Total duration of dive	sec
TDR2_8S	DESC_TIME	Time spent in descent phase	sec
TDR2_8S	BOTT_TIME	Time spent in bottom phase	sec
TDR2_8S	ASC_TIME	Time spent in ascent phase	sec
TDR2_8S	DESC_RATE	Average rate of descent	m/sec
TDR2_8S	ASC_RATE	Average rate of ascent	m/sec
TDR2_8S	PDI	Surface time after dive	sec
TDR2_8S	WIGGLES_DESC	# of vertical inflections during descent	count
TDR2_8S	WIGGLES_BOTT	# of vertical inflections during bottom	count
TDR2_8S	WIGGLES_ASC	# of vertical inflections during ascent	count
TDR2_8S	TOT_VERT_DIST_BOTT	Sum of all depth changes during bottom	m
TDR2_8S	BOTT_RANGE	Max-min depth of bottom phase	m
TDR2_8S	EFFICIENCY	Ratio of bottom time to dive cycle	
TDR2_8S	IDZ	Binary indicator of whether max depth is within 20% of previous dive's max depth	
TDR2_8S	SOLAR_EL	Angle of sun relative to horizon	degrees
TDR2_8S	LAT	Decimal latitude at start of dive	decimal degrees
TDR2_8S	LON	Decimal longitude at start of dive	decimal degrees
TDR2_8S	LAT_SE_KM	Latitude error	km
TDR2_8S	LON_SE_KM	Longitude error	km
TDR2_8S	YEAR	Year at start of dive	
TDR2_8S	MONTH	Month at start of dive	
TDR2_8S	DAY	Day at start of dive	
TDR2_8S	HOUR	Hour at start of dive	
TDR2_8S	MIN	Minute at start of dive	
TDR2_8S	SEC	Second at start of dive	
TDR3	**Group contains dive statistics and locations for the third TDR at full resolution**		
TDR3	DATE	Date time at start of dive	UTC

Quality Control Flags

Group	Variable	Description	Units
TDR3	MAXDEPTH	Max depth recorded during dive	m
TDR3	DURATION	Total duration of dive	sec
TDR3	DESC_TIME	Time spent in descent phase	sec
TDR3	BOTT_TIME	Time spent in bottom phase	sec
TDR3	ASC_TIME	Time spent in ascent phase	sec
TDR3	DESC_RATE	Average rate of descent	m/sec
TDR3	ASC_RATE	Average rate of ascent	m/sec
TDR3	PDI	Surface time after dive	sec
TDR3	WIGGLES_DESC	# of vertical inflections during descent	count
TDR3	WIGGLES_BOTT	# of vertical inflections during bottom	count
TDR3	WIGGLES_ASC	# of vertical inflections during ascent	count
TDR3	TOT_VERT_DIST_BOTT	Sum of all depth changes during bottom	m
TDR3	BOTT_RANGE	Max-min depth of bottom phase	m
TDR3	EFFICIENCY	Ratio of bottom time to dive cycle	
TDR3	IDZ	Binary indicator of whether max depth is within 20% of previous dive's max depth	
TDR3	SOLAR_EL	Angle of sun relative to horizon	degrees
TDR3	LAT	Decimal latitude at start of dive	decimal degrees
TDR3	LON	Decimal longitude at start of dive	decimal degrees
TDR3	LAT_SE_KM	Latitude error	km
TDR3	LON_SE_KM	Longitude error	km
TDR3	YEAR	Year at start of dive	
TDR3	MONTH	Month at start of dive	
TDR3	DAY	Day at start of dive	
TDR3	HOUR	Hour at start of dive	
TDR3	MIN	Minute at start of dive	
TDR3	SEC	Second at start of dive	
TDR3_8S	**Group contains dive statistics and locations for the third TDR at 8 s (subsampled or full-res)**		
TDR3_8S	DATE	Date time at start of dive	UTC
TDR3_8S	MAXDEPTH	Max depth recorded during dive	m
TDR3_8S	DURATION	Total duration of dive	sec
TDR3_8S	DESC_TIME	Time spent in descent phase	sec
TDR3_8S	BOTT_TIME	Time spent in bottom phase	sec
TDR3_8S	ASC_TIME	Time spent in ascent phase	sec
TDR3_8S	DESC_RATE	Average rate of descent	m/sec

Quality Control Flags

Group	Variable	Description	Units
TDR3_8S	ASC_RATE	Average rate of ascent	m/sec
TDR3_8S	PDI	Surface time after dive	sec
TDR3_8S	WIGGLES_DESC	# of vertical inflections during descent	count
TDR3_8S	WIGGLES_BOTT	# of vertical inflections during bottom	count
TDR3_8S	WIGGLES_ASC	# of vertical inflections during ascent	count
TDR3_8S	TOT_VERT_DIST_BOTT	Sum of all depth changes during bottom	m
TDR3_8S	BOTT_RANGE	Max-min depth of bottom phase	m
TDR3_8S	EFFICIENCY	Ratio of bottom time to dive cycle	
TDR3_8S	IDZ	Binary indicator of whether max depth is within 20% of previous dive's max depth	
TDR3_8S	SOLAR_EL	Angle of sun relative to horizon	degrees
TDR3_8S	LAT	Decimal latitude at start of dive	decimal degrees
TDR3_8S	LON	Decimal longitude at start of dive	decimal degrees
TDR3_8S	LAT_SE_KM	Latitude error	km
TDR3_8S	LON_SE_KM	Longitude error	km
TDR3_8S	YEAR	Year at start of dive	
TDR3_8S	MONTH	Month at start of dive	
TDR3_8S	DAY	Day at start of dive	
TDR3_8S	HOUR	Hour at start of dive	
TDR3_8S	MIN	Minute at start of dive	
TDR3_8S	SEC	Second at start of dive	