

Supporting Information for

Present-day Deformation in the Incipient Strike-slip Basin of the Okavango Delta (Botswana): Impact on the Ecosystem

Olivier Dauteuil¹, Louis Gaudaré¹, Marc Jolivet¹, Mickael Murray-Hudson², Piotr Wolski³, Kaelo Makati², Moss Edmison²

¹ Géosciences-Rennes, UMR-CNRS 6118, University of Rennes, 35042 Rennes, France

² Okavango Research Institute, University of Botswana, Private Bag 285, Maun, Botswana

³ Climate System Analysis Group, University of Cape Town, Private Bag X3, 7701, Rondebosch, Cape Town, South Africa

**Corresponding author: Olivier Dauteuil (olivier.dauteuil@univ-rennes.fr)*

Processing parameters for GNSS data included in rnx2rtkp module:

```
1 # RTKPSO options (2013/03/01 10:41:04, v.2.4.2)
2
3 # RTKPSO options (2013/03/01 10:41:04, v.2.4.2)
4 pos1-posmode =7 # (0:single,1:dgps,2:kinematic,3:static,4:movingbase,5:fixed,6:ppp-kine,7:ppp-static)
5 pos1-frequency =l1+l2 # (1:l1,2:l1+l2,3:l1+l2+l5)
6 pos1-soltype =combined # (0:forward,1:backward,2:combined)
7 pos1-elmask =10 # deg
8 pos1-snrmask_r =on
9 pos1-snrmask_b =off
10 pos1-snrmask_L1 =0,0,0,0,0,0,0,0,0
11 pos1-snrmask_L2 =0,0,0,0,0,0,0,0,0
12 pos1-snrmask_L5 =0,0,0,0,0,0,0,0,0
13 pos1-dynamics =on # (0:off,1:on)
14 pos1-tidecorr =on # (0:off,1:on)
15 pos1-ionoopt =dual-freq # (0:off,1:brdc,2:sbas,3:dual-freq,4:est-stec,5:ionex-tec,6:qzs-brdc,7:qzs-lex,8:vtec_sf,9:vtec_ef,10:gtec)
16 pos1-tropopt =est-ztdgrad # (0:off,1:saas,2:sbas,3:est-ztd,4:est-ztdgrad)
17 pos1-sateph =precise # (0:brdc,1:precise,2:brdc+sbas,3:brdc+ssrapc,4:brdc+ssrcom)
18 pos1-posopt1 =on # (0:off,1:on)
19 pos1-posopt2 =on # (0:off,1:on)
20 pos1-posopt3 =on # (0:off,1:on)
21 pos1-posopt4 =on # (0:off,1:on)
22 pos1-posopt5 =off # (0:off,1:on)
23 pos1-exclsats = #
24 pos1-navsys =63 # (1:gps+2:sbas+4:glo+8:gal+16:qzs+32:comp)
25 pos2-armode =3 # (0:off,1:continuous,2:instantaneous,3:fix-and-hold)
26 pos2-gloarmode =on # (0:off,1:on,2:autocal)
27 pos2-arthres =3
28 pos2-arlockcnt =0
29 pos2-arelmask =10 # (deg)
30 pos2-arminfix =10
31 pos2-elmaskhold =0 # (deg)
32 pos2-aroutcnt =5
33 pos2-maxage =30 # (s)
34 pos2-slipthres =0.05 # (m)
35 pos2-rejionno =30 # (m)
36 pos2-rejgdop =30
37 pos2-niter =1
38 pos2-baselen =0
39 pos2-basesig =0
40 out-solformat =llh # (0:llh,1:xyz,2:enu,3:nmea)
41 out-outhead =on # (0:off,1:on)
42 out-outopt =on # (0:off,1:on)
43 out-timesys =gpst # (0:gpst,1:utc,2:jst)
44 out-timeform =hms # (0:tow,1:hms)
45 out-timendec =3
46 out-degform =deg
47 out-fieldsep =
48 out-height =ellipsoidal # (0:ellipsoidal,1:geodetic)
49 out-geoid =internal # (0:internal,1:egm96,2:egm08_2.5,3:egm08_1,4:gsi2000)
50 out-solstatic =single # (0:all,1:single)
51 out-nmeaintv1 =1 # (s)
52 out-nmeaintv2 =1 # (s)
53
```

54 out-outstat =off # (0:off,1:state,2:residual)
55 stats-eratio1 =300
56 stats-eratio2 =300
57 stats-errphase =0.003 # (m)
58 stats-errphaseel =0.003 # (m)
59 stats-errphasebl =0 # (m/10km)
60 stats-errdoppler =1 # (Hz)
61 stats-stdbias =30 # (m)
62 stats-stdiono =0.03 # (m)
63 stats-stdtrop =0.3 # (m)
64 stats-prnaccelh =10 # (m/s^2)
65 stats-prnaccelv =10 # (m/s^2)
66 stats-prnbias =0.0001 # (m)
67 stats-prniono =0.001 # (m)
68 stats-prntrop =0.0001 # (m)
69 stats-clkstabil =5e-12 # (s/s)
70 ant1-postype =xyz # (0:llh,1:xyz,2:single,3:posfile,4:rinexhead,5:rtcm)
71 ant1-pos1 =4927175224 # (deg|m)
72 ant1-pos2 =-256868.3617 # (deg|m)
73 ant1-pos3 =4697996.1660 # (m|m)
74 ant1-anttype =TRM41249.00
75 ant1-antdele =0 # (m)
76 ant1-antdeln =0 # (m)
77 ant1-antdelu =0 # (m)
78 ant2-postype =xyz # (0:llh,1:xyz,2:single,3:posfile,4:rinexhead,5:rtcm)
79 ant2-pos1 =0 # (deg|m)
80 ant2-pos2 =0 # (deg|m)
81 ant2-pos3 =0 # (deg|m)
82 ant2-anttype =TRM29659.00
83 ant2-antdele =0 # (m)
84 ant2-antdeln =0 # (m)
85 ant2-antdelu =0 # (m)
86 misc-timeinterp =off # (0:off,1:on)
87 misc-sbasatsel =0 # (0:all)
88 misc-rnxopt1 =
89 misc-rnxopt2 =
90 file-staposfile =
91 file-geoidfile =
92 file-ionofile =
93 file-dcbfile =
94 file-eopfile =
95 file-blqfile =
96 file-tempdir =
97 file-geexefile =
98 file-solstatfile =
99 file-tracefile =



Table SI-1: displacements relative to MAUA. U_x : east-west displacement component; U_y : north-south displacement component; U_u : up displacement component; V_x : east-west displacement rate; V_y : north-south displacement rate; U_u : up displacement rate; uU_x : uncertainty of east-west component; ; uU_y : uncertainty of north-south component; ; uU_u : uncertainty up component.

Period 2010-2012 (2 years)

Site	Longitude	Latitude	U_x (m)	V_x (m)	uU_x (m)	U_y (m/yr)	V_y (m/yr)	uU_y (m)	U_u (m)	V_u (m/yr)	uU_u (m)	Horizontal displacement (m)	Horizontal rate (m/yr)	Azimuth (Deg)
BOTH	22.750121	-20.54795	0.0363	0.0182	0.0013	0.0777	0.0388	0.0012	-0.0188	-0.0094	0.0057	0.0858	0.0429	25.0
GUMA	22.372752	-18.962215	0.0855	0.0428	0.0034	0.046	0.023	0.0027	-0.0648	-0.0324	0.0153	0.0971	0.0485	61.7
KWAI	23.750344	-19.174437	0.0774	0.0387	0.0032	0.0678	0.0339	0.0022	-0.0749	-0.0374	0.0174	0.1029	0.0514	48.8
MAUA	23.528398	-19.902242	0.1304	0.0652	0.001	0.0524	0.0262	0.0009	0.0469	0.0234	0.0043	0.1405	0.0703	68.1
NOKA	22.194283	-19.662089	0.1039	0.052	0.0017	0.0795	0.0398	0.0016	-0.0169	-0.0084	0.007	0.1308	0.0654	52.6
NXAR	23.179143	-19.548093	0.0494	0.0247	0.0014	0.0381	0.019	0.0019	-0.0084	-0.0042	0.0056	0.0624	0.0312	52.4
SANK	23.87431	-19.428997	0.0	0.0	0.0018	0.0322	0.0161	0.0016	-0.0813	-0.0406	0.0086	0.0322	0.0161	0.0
SEPU	22.161214	-18.735598	0.0728	0.0364	0.002	0.0708	0.0354	0.0016	-0.0188	-0.0094	0.0072	0.1016	0.0508	45.8



Period 2010-2014 (4 years)

Site	Longitude	Latitude	Ux (m)	Vx (m)	uUx (m)	Uy (m/yr)	Vy (m/yr)	uUy (m)	Uu (m)	Vu (m/yr)	uUu (m)	Horizontal displacement (m)	Horizontal rate (m/yr)	Azimuth (Deg)
BOTH	22.750121	-20.54795	0.0562	0.014	0.001	0.0974	0.0244	0.0008	0.0291	0.0073	0.0042	0.1125	0.0281	30.0
GUMA	22.372752	-18.962215	0.1641	0.041	0.0042	0.1019	0.0255	0.0033	0.0762	0.019	0.0182	0.1932	0.0483	58.2
KWAI	23.750344	-19.174437	0.1589	0.0397	0.0016	0.0596	0.0149	0.0016	-0.0161	-0.004	0.0076	0.1697	0.0424	69.4
MAUA	23.528398	-19.902242	0.0221	0.0055	0.0022	0.0869	0.0217	0.0014	0.0274	0.0068	0.007	0.0897	0.0224	14.3
NOKA	22.194283	-19.662089	0.1039	0.026	0.0012	0.0939	0.0235	0.0012	0.0568	0.0142	0.0054	0.14	0.035	47.9
NXAR	23.179143	-19.548093	0.1189	0.0297	0.0015	0.0822	0.0206	0.0016	0.0293	0.0073	0.0074	0.1445	0.0361	55.3
SANK	23.87431	-19.428997	0.0239	0.006	0.0015	0.0	0.0	0.0015	0.0493	0.0123	0.0073	0.0239	0.006	90.0
SEPU	22.161214	-18.735598	0.1116	0.0279	0.0016	0.0924	0.0231	0.0017	0.094	0.0235	0.0072	0.1449	0.0362	50.4



Period 2010-2022 (12 years)

Site	Longitude	Latitude	Ux (m)	Vx (m)	uUx (m)	Uy (m/yr)	Vy (m/yr)	uUy (m)	Uu (m)	Vu (m/yr)	uUu (m)	Horizontal displacement (m)	Horizontal rate (m/yr)	Azimuth h (Deg)
BOTH	22.750121	-20.54795	-0.0145	-0.0012	0.0014	0.1553	0.0129	0.0012	0.0122	0.001	0.0062	0.156	0.013	-5.3
GUMA	22.372752	-18.962215	0.2969	0.0247	0.0038	0.1833	0.0153	0.0029	0.0427	0.0036	0.0174	0.3489	0.0291	58.3
KWAI	23.750344	-19.174437	-0.0128	-0.0011	0.0018	0.1391	0.0116	0.0015	-0.0931	-0.0078	0.009	0.1397	0.0116	-5.3
MAUA	23.528398	-19.902242	0.1887	0.0157	0.001	0.0717	0.006	0.001	0.0066	0.0006	0.0049	0.2019	0.0168	69.2
NOKA	22.194283	-19.662089	0.1024	0.0085	0.002	0.1532	0.0128	0.0016	0.0969	0.0081	0.008	0.1843	0.0154	33.8
NXAR	23.179143	-19.548093	--	--	--	--	--	--	--	--	--	--	--	--
SANK	23.87431	-19.428997	0.1713	0.0143	0.0031	0.2061	0.0172	0.0022	-0.0369	-0.0031	0.0148	0.268	0.0223	39.7
SEPU	22.161214	-18.735598	0.2354	0.0196	0.0014	0.2094	0.0174	0.0012	-0.0318	-0.0026	0.0064	0.3151	0.0263	48.3



Period 2010-2023 (13 years)

Site	Longitude	Latitude	Ux (m)	Vx (m)	uUx (m)	Uy (m/yr)	Vy (m/yr)	uUy (m)	Uu (m)	Vu (m/yr)	uUu (m)	Horizontal displacement (m)	Horizontal rate (m/yr)	Azimuth (Deg)
BOTH	22.750121	-20.54795	0.0401	0.0031	0.0011	0.2019	0.0155	0.001	0.0018	0.0001	0.0048	0.2058	0.0158	11.2
GUMA	22.372752	-18.962215	0.2697	0.0207	0.0031	0.2224	0.0171	0.0026	-0.054	-0.0042	0.0146	0.3496	0.0269	50.5
KWAI	23.750344	-19.174437	0.137	0.0105	0.0016	0.1324	0.0102	0.0014	-0.059	-0.0045	0.0082	0.1905	0.0147	46.0
MAUA	23.528398	-19.902242	0.0657	0.0051	0.001	0.1739	0.0134	0.001	0.1012	0.0078	0.0049	0.1859	0.0143	20.7
NOKA	22.194283	-19.662089	0.3224	0.0248	0.0012	0.1931	0.0149	0.0012	0.0789	0.0061	0.0054	0.3758	0.0289	59.1
NXAR	23.179143	-19.548093	0.2849	0.0219	0.006	0.2183	0.0168	0.0104	-0.0179	-0.0014	0.0186	0.3589	0.0276	52.5
SANK	23.87431	-19.428997	0.2228	0.0171	0.0012	0.2586	0.0199	0.001	0.1452	0.0112	0.0063	0.3413	0.0263	40.7
SEPU	22.161214	-18.735598	0.2094	0.0161	0.0012	0.244	0.0188	0.001	-0.0427	-0.0033	0.0051	0.3215	0.0247	40.6



Table SI-2: displacements relative to MAUA. U_x : east-west displacement component; U_y : north-south displacement component; U_u : up displacement component; V_x : east-west displacement rate; V_y : north-south displacement rate; U_u : up displacement rate; uU_x : uncertainty of east-west component; ; uU_y : uncertainty of north-south component; ; uU_u : uncertainty up component.

Period 2010-2012 (2 years)

Site	Longitude	Latitude	U_x (m)	V_x (m)	uU_x (m)	U_y (m/yr)	V_y (m/yr)	uU_y (m)	U_u (m)	V_u (m/yr)	uU_u (m)	Horizontal displacement (m)	Horizontal rate (m/yr)	Azimut (Deg)
BOTH	22.750121	-20.54795	-0.0941	-0.047	0.0013	0.0253	0.0126	0.0012	-0.0657	-0.0328	0.0057	0.0974	0.0487	285.0
GUMA	22.372752	-18.962215	-0.0449	-0.0224	0.0034	-0.0064	-0.0032	0.0027	-0.1117	-0.0558	0.0153	0.0454	0.0227	261.9
KWAI	23.750344	-19.174437	-0.0529	-0.0264	0.0032	0.0154	0.0077	0.0022	-0.1218	-0.0609	0.0174	0.0551	0.0275	286.2
MAUA	23.528398	-19.902242	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NOKA	22.194283	-19.662089	-0.0265	-0.0132	0.0017	0.0271	0.0136	0.0016	-0.0638	-0.0319	0.007	0.0379	0.019	315.6
NXAR	23.179143	-19.548093	-0.081	-0.0405	0.0014	-0.0143	-0.0072	0.0019	-0.0553	-0.0276	0.0056	0.0823	0.0411	260.0
SANK	23.87431	-19.428997	-0.1304	-0.0652	0.0018	-0.0202	-0.0101	0.0016	-0.1282	-0.0641	0.0086	0.132	0.066	261.2
SEPU	22.161214	-18.735598	-0.0575	-0.0288	0.002	0.0184	0.0092	0.0016	-0.0657	-0.0328	0.0072	0.0604	0.0302	287.7



Period 2010-2014 (4 years)

Site	Longitude	Latitude	Ux (m)	Vx (m)	uUx (m)	Uy (m/yr)	Vy (m/yr)	uUy (m)	Uu (m)	Vu (m/yr)	uUu (m)	Horizontal displacement (m)	Horizontal rate (m/yr)	Azimuth (Deg)
BOTH	22.750121	-20.54795	0.0341	0.0085	0.001	0.0105	0.0026	0.0008	0.0017	0.0004	0.0042	0.0357	0.0089	72.9
GUMA	22.372752	-18.962215	0.1421	0.0355	0.0042	0.015	0.0038	0.0033	0.0488	0.0122	0.0182	0.1429	0.0357	84.0
KWAI	23.750344	-19.174437	0.1368	0.0342	0.0016	-0.0273	-0.0068	0.0016	-0.0435	-0.0109	0.0076	0.1395	0.0349	101.3
MAUA	23.528398	-19.902242	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NOKA	22.194283	-19.662089	0.0818	0.0204	0.0012	0.007	0.0018	0.0012	0.0294	0.0074	0.0054	0.0821	0.0205	85.1
NXAR	23.179143	-19.548093	0.0969	0.0242	0.0015	-0.0047	-0.0012	0.0016	0.0019	0.0005	0.0074	0.097	0.0243	92.8
SANK	23.87431	-19.428997	0.0018	0.0004	0.0015	-0.0869	-0.0217	0.0015	0.0219	0.0055	0.0073	0.0869	0.0217	178.8
SEPU	22.161214	-18.735598	0.0896	0.0224	0.0016	0.0054	0.0014	0.0017	0.0666	0.0167	0.0072	0.0898	0.0224	86.6



Period 2010-2022 (12 years)

Site	Longitude	Latitude	Ux (m)	Vx (m)	uUx (m)	Uy (m/yr)	Vy (m/yr)	uUy (m)	Uu (m)	Vu (m/yr)	uUu (m)	Horizontal displacement (m)	Horizontal rate (m/yr)	Azimut (Deg)
BOTH	22.750121	-20.54795	-0.2033	-0.0169	0.0014	0.0836	0.007	0.0012	0.0056	0.0005	0.0062	0.2198	0.0183	292.4
GUMA	22.372752	-18.962215	0.1082	0.009	0.0038	0.1116	0.0093	0.0029	0.0361	0.003	0.0174	0.1554	0.013	44.1
KWAI	23.750344	-19.174437	-0.2015	-0.0168	0.0018	0.0675	0.0056	0.0015	-0.0997	-0.0083	0.009	0.2125	0.0177	288.5
MAUA	23.528398	-19.902242	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NOKA	22.194283	-19.662089	-0.0863	-0.0072	0.002	0.0815	0.0068	0.0016	0.0903	0.0075	0.008	0.1187	0.0099	313.4
NXAR	23.179143	-19.548093	--	--	--	--	--	--	--	--	--	--	--	--
SANK	23.87431	-19.428997	-0.0175	-0.0015	0.0031	0.1344	0.0112	0.0022	-0.0435	-0.0036	0.0148	0.1355	0.0113	352.6
SEPU	22.161214	-18.735598	0.0467	0.0039	0.0014	0.1378	0.0115	0.0012	-0.0384	-0.0032	0.0064	0.1455	0.0121	18.7



Period 2010-2023 (13 years)

Site	Longitude	Latitude	Ux (m)	Vx (m)	uUx (m)	Uy (m/yr)	Vy (m/yr)	uUy (m)	Uu (m)	Vu (m/yr)	uUu (m)	Horizontal displacement (m)	Horizontal rate (m/yr)	Azimut (Deg)
BOTH	22.750121	-20.54795	-0.0256	-0.002	0.0011	0.028	0.0022	0.001	-0.0994	-0.0076	0.0048	0.0379	0.0029	317.6
GUMA	22.372752	-18.962215	0.204	0.0157	0.0031	0.0485	0.0037	0.0026	-0.1552	-0.0119	0.0146	0.2097	0.0161	76.6
KWAI	23.750344	-19.174437	0.0713	0.0055	0.0016	-0.0414	-0.0032	0.0014	-0.1602	-0.0123	0.0082	0.0824	0.0063	120.1
MAUA	23.528398	-19.902242	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NOKA	22.194283	-19.662089	0.2567	0.0197	0.0012	0.0192	0.0015	0.0012	-0.0223	-0.0017	0.0054	0.2574	0.0198	85.7
NXAR	23.179143	-19.548093	0.2192	0.0169	0.006	0.0445	0.0034	0.0104	-0.1191	-0.0092	0.0186	0.2237	0.0172	78.5
SANK	23.87431	-19.428997	0.1571	0.0121	0.0012	0.0847	0.0065	0.001	0.044	0.0034	0.0063	0.1785	0.0137	61.7
SEPU	22.161214	-18.735598	0.1437	0.0111	0.0012	0.0701	0.0054	0.001	-0.1439	-0.0111	0.0051	0.1599	0.0123	64.0