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LAMPIRAN

Lampiran 1. Deret Taylor

Waktu tempuh yang digunakan berdasarakan kecepatam adalah t^{cal} yang biasanya berbeda dengan hasil observasi. Selisih antara waktu tempuh dan waktu kalkulasi dapat dihitung dengan persamaan:

$$r_k^i = (t^{obs} - t^{cal})_k^i \quad (1.1)$$

Dan t^{cal} dapat dinyatakan sebagai:

$$t^{cal} = \frac{\sqrt{(x_{i-}x_k)^2 + (y_{i-}y_k)^2 + (z_{i-}z_k)^2}}{v_p} \quad (1.2)$$

(xi, yi, zi) merupakan lokasi hiposenter dan (xk,yk,zk) adalah lokasi stasiun.

Pada persamaan 1.2 merupakan persamaan non-linear. Untuk menyelesaikan persamaan tersebut maka dilinearkan dengan asumsi bahwa model kecepatan sudah mendekati model sebenarnya serta pembacaan waktu tempuh (*travel time)* sudah benar, sehingga selisih waktu tempuh sudah benar. Diketahui bahwa selisih waktu tempuh adalah fungsi linier sederhana dari selisih parameter dugaan dan sebenarnya. Inversi linier dapat dituliskan sebagai berikut:

$$d = g(m) \quad (1.3)$$

Dimana d = data, g = fungsi model, m = model. Model yang digunakan pada persamaan 1.2 adalah $(x_{i-}x_k)^2 + (y_{i-}y_k)^2 + (z_{i-}z_k)^2$ maka untuk melinierisasikan persmaan 1.2 dibutuhkan deret taylor.

$$gm = gm_0 + \frac{\partial g(m)}{\partial m}\Delta m + \frac{1}{2}\frac{\partial^2 g(m)}{\partial m^2}\Delta m^2 + \cdots \quad (1.4)$$

Persamaan tersebut linier pada orde pertama maka persamaan 1.4 hanya diambil sampai orde pertama. Sehingga didapatkan:

$$gm = gm_0 + \frac{\partial g(m)}{\partial m}\Delta m \quad (1.5)$$

$$d = gm_0 + \frac{\partial g(m)}{\partial m}\Delta m \quad (1.6)$$

$$d - gm_0 = \frac{\partial g(m)}{\partial m} \Delta m \quad (1.7)$$

$$\Delta d = J.\Delta m \quad (1.8)$$

Dimana:

g = fungsi nonlinier dari parameter model

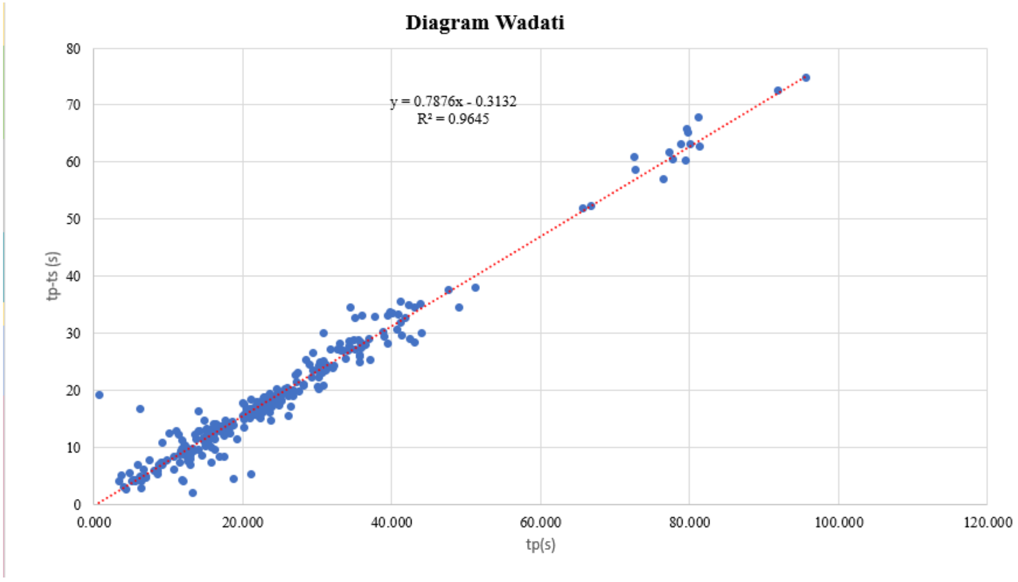
m = mo + Δm

d = g (mo + Δm)

Dari persamaan di atas dinyatakan dalam matriks jacobian. Persamaan 1.8 merupakan komponen turunan parsial yang membentuk matriks jacobi.

Lampiran 2. Kecepatan gelombang vp/vs dengan menggunakan wadati

Perhitungan perbandingan kecepatan gelombang vp/vs dengan menggunakan diagram wadati didapatkan hasil vp/vs = 1.78



Lampiran 3. Koordinat Stasiun Pencatat gempa

		Latitude	Longitude
1	APSI	121.6487	-0.9108
2	BBKI	114.8411	-3.4625
3	BBSI	122.5695	-5.4885
4	BKSI	120.1224	-5.3218
5	BSSI	120.4904	-6.1428
6	KKSI	121.6513	-4.1717
7	KMSI	123.8907	0.5745
8	MPSI	119.8980	0.3374
9	PMSI	118.9149	-3.5008
10	SMKI	117.2085	-0.4461
11	SMSI	122.3654	0.9885
12	SPSI	119.7691	-3.9646
13	TTSI	119.8190	-3.0451
14	KDI	122.6193	-3.9574
15	PCI	119.8366	-0.9055
16	BKB	116.9048	-1.1073
17	LUWI	122.7716	-1.0418
18	MSSI	120.7219	-4.7006
19	TOLI2	120.7945	1.1214
20	KAPI	119.7517	-5.0142
21	GTOI	122.8700	-3.7628
22	MMSI	118.9090	-2.6892
23	MKS	119.7517	-5.2178
24	MRSI	121.9406	0.4771
25	SRSI	120.8779	-2.531
26	MJSI	118.909	-3.5008
27	BKB	116.9048	-5.0344
28	KAPI	119.7571	-5.0142
29	BNSI	120.1065	-4.4001
30	PCI	119.8366	-1.0056
31	SMSI	122.3654	0.9998
32	TOLI	120.7944	1.1214

Lampiran 4. Tampilan data Katalog

```
----------------------------------------------------------------------------------
Event:
Public ID               bmg2021zeaz
Preferred Origin ID     Origin/20211224232925.371883.658177
Preferred Magnitude ID Magnitude/20211224232928.543459.658185
Description
region name: Sulawesi, Indonesia
Creation time           2021-12-24 23:29:30

Origin:
Public ID               Origin/20211224232925.371883.658177
Date                    2021-12-24
Time                    23:26:41.894  +/-    1.5 s
Latitude                 -2.74 deg  +/-    6  km
Longitude               118.73 deg  +/-    7  km
Depth                       10  km
Agency                  BMKG
Author                  scolv@gts-tg-gui-prod.tews
Mode                    manual
Status                  confirmed
Creation time           2021-12-24 23:29:25
Residual RMS               0.32 s
Azimuthal gap              302 deg

3 Network magnitudes:
MLv       2.35           2 preferred  BMKG
M         2.35           2            BMKG1
Mjma      2.35           2            BMKG1

8 Phase arrivals:
sta  net   dist azi  phase   time         res     wt  sta
MMSI  IA   0.19  75  P       23:26:31.541 -15.3 MX 0.0  MMSI
MMSI  IA   0.19  75  S       23:26:50.698   0.2 M  1.0  MMSI
MMCI  IA   0.67 109  P       23:26:54.694  -0.6 M  1.0  MMCI
MMCI  IA   0.67 109  S       23:27:04.734  -0.4 M  1.0  MMCI
LPCM  IA   1.11 133  P       23:27:02.787   0.1 M  1.0  LPCM
LPCM  IA   1.11 133  S       23:27:18.257   0.2 M  1.0  LPCM
TTSI  IA   1.13 106  P       23:27:03.299   0.2 M  1.0  TTSI
TTSI  IA   1.13 106  S       23:27:18.871   0.2 M  1.0  TTSI
```

```
# 2021 12 24 23 26 41.9  -02.74    118.73     10.0  2.4   0.0   0.0   0.320          1
  MMSI      -10.36   1.000    P
  MMSI        8.80   1.000    S
  MMCI       12.79   1.000    P
  MMCI       22.83   1.000    S
  LPCM       20.89   1.000    P
  LPCM       36.36   1.000    S
  TTSI       21.40   1.000    P
  TTSI       36.97   1.000    S
# 2021 12 12 00 03 06.2  -03.06    119.02     10.0  2.7   0.0   0.0   0.830          2
  MMCI        5.91   1.000    P
  MMCI       12.87   1.000    S
  PMSI        9.18   1.000    P
  LPCM       13.68   1.000    P
  TTSI       15.84   1.000    P
  SPSI       22.05   1.000    P
  MSCM       24.86   1.000    P
  MSCM       44.30   1.000    S
  PWCM       27.63   1.000    P
  LOCM       30.87   1.000    P
  LOCM       56.14   1.000    S
  BBCM       36.79   1.000    P
  BBCM       65.23   1.000    S
# 2021 12 11 23 33 25.1  -02.66    118.87     23.0  2.4   0.0   0.0   0.450          3
  MMCI       12.19   1.000    P
  MMCI       21.25   1.000    S
  PMSI       15.12   1.000    P
  PMSI       28.43   1.000    S
  TTSI       18.64   1.000    P
  LPCM       20.12   1.000    P
  LPCM       33.49   1.000    S
  SPSI       26.65   1.000    P
  SPSI       46.67   1.000    S
# 2021 10 03 02 31 24.4  -02.88    118.60     12.0  3.2   0.0   0.0   0.370          4
  MMSI        8.52   1.000    P
  MMSI       14.45   1.000    S
  PMSI       14.17   1.000    P
  MMCI       14.96   1.000    P
  MMCI       26.01   1.000    S
  LPCM       20.07   1.000    P
```

Lampiran 5. Format Masukan ph2dt

```
* ph2dt.inp - input control file for program ph2dt
* Input station file:
stasiun.dat
* Input phase file:
sulbar.pha
*MINWGHT: min. pick weight allowed [0]
*MAXDIST: max. distance in km between event pair and stations [500]
*MAXSEP: max. hypocentral separation in km [100]
*MAXNGH: max. number of neighbors per event [8]
*MINLNK: min. number of links required to define a neighbor [4]
*MINOBS: min. number of links per pair saved [4]
*MAXOBS: max. number of links per pair saved [20]
*MINWGHT MAXDIST MAXSEP MAXNGH MINLNK MINOBS MAXOBS
   0        400      95      10       2       2     20
```

Lampiran 6. Format Masukan HypoDD

* RELOC.INP:

*--- input file selection

* cross correlation diff times:

*

*catalog P diff times:

dt.ct

*

* event file:

event.dat

*

* station file:

stasiun.dat

*

*--- output file selection

* original locations:

hypoDD.loc

* relocations:

hypoDD.reloc

* station information:

hypoDD.sta

* residual information:

hypoDD.res

* source paramater information:

*hypoDD.src

*

*--- data type selection:

* IDAT: 0 = synthetics; 1= cross corr; 2= catalog; 3= cross & cat

* IPHA: 1= P; 2= S; 3= P&S

* DIST:max dist [km] between cluster centroid and station

* IDAT   IPHA   DIST

   2   3   400

*

*--- event clustering:

* OBSCC: min # of obs/pair for crosstime data (0= no clustering)

* OBSCT: min # of obs/pair for network data (0= no clustering)

* OBSCC OBSCT

    0   2

*

*--- solution control:

* ISTART: 1 = from single source; 2 = from network sources

* ISOLV: 1 = SVD, 2=lsqr

* NSET: number of sets of iteration with specifications following

* ISTART ISOLV NSET

   2   2   2

*

*--- data weighting and re-weighting:

* NITER: last iteration to used the following weights

* WTCCP, WTCCS: weight cross P, S

* WTCTP, WTCTS: weight catalog P, S

* WRCC, WRCT: residual threshold in sec for cross, catalog data

* WDCC, WDCT: max dist [km] between cross, catalog linked pairs

```
* DAMP:                  damping (for lsqr only)
*      ---  CROSS DATA ----- ----CATALOG DATA ----
* NITER WTCCP WTCCS WRCC WDCC WTCTP WTCTS WRCT WDCT
DAMP
  4     -9     -9   -9   -9    1      1   4     95   15
  4     -9     -9   -9   -9    1      1   4     95   14
*
*--- 1D model:
* NLAY:                  number of model layers
* RATIO:       vp/vs ratio
* TOP:            depths of top of layer (km)
* VEL:                     layer velocities (km/s)
* NLAY  RATIO
   8    1.78
* TOP
4.0 20.0 35.0 40.0 120.0 171.0 210.0 271.0
* VEL
5.80 6.50 8.04 8.05  8.19  8.30  8.52  8.88
*
*--- event selection:
* CID:            cluster to be relocated (0 = all)
* ID:    cuspids of event to be relocated (8 per line)
* CID
    0
* ID
```

Lampiran 6. Tampilan data Masukan Hypodd

20211224	23264190	-2.7400	118.7300	10.000	2.4	0.00	0.00	0.32	1
20211212	30620	-3.0600	119.0200	10.000	2.7	0.00	0.00	0.83	2
20211211	23332510	-2.6600	118.8700	23.000	2.4	0.00	0.00	0.45	3
20211003	2312440	-2.8800	118.6000	12.000	3.2	0.00	0.00	0.37	4
20210906	21361150	-2.8700	118.9900	12.000	2.0	0.00	0.00	0.10	5
20210905	11030990	-3.3900	119.2000	10.000	1.9	0.00	0.00	1.33	6
20210824	3522710	-2.7000	118.7300	10.000	3.1	0.00	0.00	0.83	7
20210804	1581020	-3.4500	118.7000	15.000	2.6	0.00	0.00	0.82	8
20210715	5245450	-2.9900	118.8500	10.000	3.0	0.00	0.00	0.74	9
20210617	9414420	-2.5200	119.0000	10.000	3.0	0.00	0.00	0.64	10
20210613	8425660	-2.9100	118.9500	10.000	2.6	0.00	0.00	0.63	11
20210517	8340070	-3.5600	119.1200	10.000	2.8	0.00	0.00	0.16	12
20210512	21384170	-3.1900	119.0600	193.000	5.9	0.00	0.00	0.51	13
20210208	13580700	-2.6200	119.0200	12.000	2.6	0.00	0.00	0.27	14
20210203	8254020	-3.0100	118.8900	21.000	5.0	0.00	0.00	0.94	15
20210131	12131060	-2.9700	118.8600	10.000	4.7	0.00	0.00	0.52	16
20210127	18432500	-2.9700	118.8300	11.000	3.8	0.00	0.00	0.54	17
20210125	16041640	-3.0100	118.8000	47.000	2.9	0.00	0.00	0.82	18
20210124	20520810	-2.9400	118.6100	10.000	2.6	0.00	0.00	0.76	19
20210124	16525520	-3.0000	118.8000	35.000	2.5	0.00	0.00	0.42	20
20210124	2385020	-2.9500	118.8800	14.000	3.1	0.00	0.00	0.55	21
20210121	11553600	-2.9000	118.9100	10.000	4.0	0.00	0.00	0.96	22
20210120	14434850	-2.8900	118.8600	10.000	2.3	0.00	0.00	0.71	23
20210118	13513950	-2.9900	118.8800	20.000	3.5	0.00	0.00	0.53	24
20210118	9292180	-2.9400	118.8800	14.000	3.5	0.00	0.00	0.80	25
20210118	4111710	-2.9300	118.9100	10.000	3.9	0.00	0.00	1.09	26
20210116	17425890	-2.9200	119.0300	13.000	2.6	0.00	0.00	0.56	27
20210116	10455080	-2.9000	118.9400	11.000	3.4	0.00	0.00	0.74	28
20210115	23325370	-2.9200	118.9400	10.000	5.0	0.00	0.00	1.01	29
20210115	12285330	-2.8900	118.8400	10.000	3.5	0.00	0.00	1.04	30
20210115	7404990	-2.9000	118.8600	24.000	3.8	0.00	0.00	1.14	31
20210115	5343860	-2.9500	118.9200	19.000	2.7	0.00	0.00	0.24	32
20210115	1075060	-2.9200	118.9500	14.000	2.6	0.00	0.00	0.35	33
20210115	252680	-2.9600	118.9200	10.000	4.3	0.00	0.00	0.88	34
20210115	133760	-2.8700	118.8800	21.000	2.6	0.00	0.00	0.76	35
20210114	22173490	-2.8900	118.9300	10.000	3.2	0.00	0.00	1.01	36
20210114	20461240	-2.9100	118.8400	10.000	3.4	0.00	0.00	0.69	37
20210114	20280790	-2.8900	118.8500	14.000	3.4	0.00	0.00	0.51	38
20210114	19590770	-2.9600	118.9100	10.000	3.2	0.00	0.00	0.69	39
20210114	19552680	-2.9000	119.0100	15.000	3.2	0.00	0.00	0.92	40

Lampiran 7 Hasil relokasi Hyodd

1	-2.792103	118.739438	12.471	-18363.3	20586.3	-2976.0	1762.9	2331.5	1974.9	2021	12	24	23	26	42.880	2.4	0	0	24	28	-9.000	0.158
2	-3.028920	118.927566	5.968	2552.4	-5600.0	-9478.9	2982.1	3277.8	2664.2	2021	12	12	0	3	5.580	2.7	0	0	11	0	-9.000	0.329
4	-2.903603	118.589038	7.699	-35082.9	8257.0	-7749.3	2663.2	2115.7	2369.6	2021	10	3	2	31	24.480	3.2	0	0	55	5	-9.000	0.220
5	-2.899961	118.980237	8.674	8408.1	8659.8	-6774.0	1778.7	1549.0	1712.7	2021	9	6	21	36	11.710	2.0	0	0	63	6	-9.000	0.119
7	-2.742376	118.747988	10.110	-17413.1	26084.9	-5336.9	1833.4	1958.6	2130.1	2021	8	24	3	52	27.490	3.1	0	0	49	22	-9.000	0.230
8	-3.344249	118.772020	6.152	-14737.1	-40467.8	-9295.6	3756.4	2347.2	3270.9	2021	8	4	1	58	10.290	2.6	0	0	33	0	-9.000	0.275
9	-2.938036	118.841018	7.828	-7069.2	4449.6	-7618.9	1231.5	1854.6	1292.0	2021	7	15	5	24	53.520	3.0	0	0	79	20	-9.000	0.193
10	-2.581847	118.975363	13.278	7867.4	43835.5	-2169.7	1643.8	2081.6	1961.7	2021	6	17	9	41	44.990	3.0	0	0	31	12	-9.000	0.097
12	-3.577414	119.100087	9.274	21725.5	-66250.3	-6172.9	2343.0	1884.5	1440.8	2021	5	17	8	34	0.760	2.8	0	0	29	0	-9.000	0.171
14	-2.613384	119.023460	11.692	13215.1	40348.3	-3756.0	1701.7	1809.5	1836.6	2021	2	8	13	58	7.190	2.6	0	0	34	14	-9.000	0.122
15	-2.945279	118.878347	17.587	-2919.2	3648.7	2138.7	1592.3	1559.5	2792.7	2021	2	3	8	25	39.190	5.0	0	0	119	18	-9.000	0.253
16	-2.969226	118.887598	9.191	-1890.8	1000.7	-6256.4	2131.0	1605.1	1416.8	2021	1	31	12	13	10.690	4.7	0	0	141	0	-9.000	0.217
17	-2.954799	118.833184	10.159	-7940.1	2596.0	-5289.6	1263.5	1465.8	1890.1	2021	1	27	18	43	25.050	3.8	0	0	101	26	-9.000	0.198
18	-3.027948	118.875837	58.929	-3198.2	-5492.5	43480.5	2226.5	2099.3	2710.9	2021	1	25	16	4	16.540	2.9	0	0	77	12	-9.000	0.195
19	-2.922618	118.608304	9.410	-32940.7	6154.4	-6037.3	2242.6	2972.2	1275.1	2021	1	24	20	52	8.180	2.6	0	0	41	0	-9.000	0.162
20	-2.980734	118.860905	39.429	-4858.3	-271.7	23982.0	1481.1	1691.3	2500.5	2021	1	24	16	52	55.830	2.5	0	0	46	16	-9.000	0.122
21	-2.929177	118.890929	13.162	-1520.5	5429.1	-2285.8	1019.7	1422.0	1799.0	2021	1	24	2	38	50.500	3.1	0	0	125	29	-9.000	0.199
22	-2.840968	118.899285	8.707	-591.6	15183.0	-6740.1	1388.1	2976.1	1440.8	2021	1	21	11	55	34.590	4.0	0	0	27	26	-9.000	0.123
23	-2.871265	118.862379	9.589	-4694.6	11832.9	-5858.4	988.6	1535.3	998.5	2021	1	20	14	43	48.050	2.3	0	0	61	25	-9.000	0.120
24	-2.954581	118.850641	21.377	-5999.3	2620.1	5929.2	2848.5	2713.2	4973.0	2021	1	18	13	51	39.630	3.5	0	0	93	0	-9.000	0.147
25	-2.898027	118.878503	14.702	-2902.0	8873.7	-746.2	1459.4	1618.4	3139.3	2021	1	18	9	29	21.940	3.5	0	0	146	31	-9.000	0.200
26	-2.910935	118.902846	9.909	-195.7	7446.3	-5538.5	2265.0	1509.0	1273.5	2021	1	18	4	11	16.870	3.9	0	0	94	3	-9.000	0.307
27	-2.919834	119.117294	13.814	23645.1	6462.3	-1634.6	2226.9	1458.7	1889.4	2021	1	16	17	42	59.430	2.6	0	0	44	1	-9.000	0.202
28	-2.898215	118.967616	12.471	7005.1	8852.8	-2977.5	5080.0	1361.6	1905.6	2021	1	16	10	45	50.880	3.4	0	0	42	3	-9.000	0.162
29	-2.906988	118.928357	12.893	2640.5	7882.8	-2554.0	1645.5	1681.9	2016.6	2021	1	15	23	32	53.310	5.0	0	0	109	23	-9.000	0.232
30	-2.894229	118.866068	10.975	-4284.4	9293.6	-4472.5	1628.7	2107.5	1763.5	2021	1	15	12	28	53.030	3.5	0	0	99	26	-9.000	0.226
31	-2.879457	118.863825	11.961	-4533.8	10927.0	-3487.6	1800.1	2166.7	1929.9	2021	1	15	7	40	48.370	3.8	0	0	103	22	-9.000	0.188
32	-2.903877	118.890637	24.829	-1553.0	8226.7	9381.1	2273.2	2484.3	3497.1	2021	1	15	5	34	38.410	2.7	0	0	99	17	-9.000	0.221
33	-2.946595	118.906719	14.720	234.9	3503.2	-728.3	2237.5	1964.5	2187.6	2021	1	15	1	7	51.470	2.6	0	0	95	0	-9.000	0.254
34	-2.963659	118.911372	8.641	752.1	1616.3	-6806.2	1808.2	2150.1	1870.0	2021	1	15	0	25	26.370	4.3	0	0	95	20	-9.000	0.251
35	-2.982341	118.889365	6.975	-1694.4	-449.5	-8473.1	2416.2	2512.0	1134.4	2021	1	15	0	13	37.470	2.6	0	0	55	1	-9.000	0.166
36	-2.853787	118.942609	6.291	4225.0	13765.5	-9156.3	1853.9	2381.5	1603.9	2021	1	14	22	17	34.410	3.2	0	0	67	22	-9.000	0.211
37	-2.924575	118.872358	7.175	-3585.1	5938.1	-8272.2	1599.7	1477.5	2015.4	2021	1	14	20	46	12.040	3.4	0	0	71	22	-9.000	0.110
38	-2.857279	118.864811	17.197	-4424.3	13379.4	1749.0	1813.2	2402.8	5186.0	2021	1	14	20	28	8.360	3.4	0	0	87	25	-9.000	0.159
39	-2.954359	118.937186	9.357	3622.0	2644.7	-6090.5	1383.2	1446.5	1708.5	2021	1	14	19	59	8.120	3.2	0	0	130	25	-9.000	0.191
40	-2.873272	118.970405	9.043	7315.3	11610.9	-6404.8	1505.0	2370.5	1731.8	2021	1	14	19	55	25.570	3.2	0	0	52	19	-9.000	0.127
41	-2.971627	118.930721	34.065	2903.2	735.3	18616.4	1776.6	2108.2	2875.3	2021	1	14	19	31	13.600	2.6	0	0	75	15	-9.000	0.133
42	-2.921333	118.939506	12.512	3879.9	6296.6	-2935.7	1451.7	2043.5	1700.1	2021	1	14	19	25	24.540	3.2	0	0	70	25	-9.000	0.146
47	-2.906714	118.915835	7.900	1248.4	7913.1	-7547.3	1296.2	1699.3	1333.2	2021	1	14	18	41	53.730	4.1	0	0	86	24	-9.000	0.196
48	-3.071610	118.949784	6.264	5022.2	-10320.5	-9183.0	2053.8	1901.2	2318.4	2021	1	14	18	39	57.210	4.1	0	0	97	15	-9.000	0.203
49	-2.979045	118.868373	19.866	-4028.0	-85.0	4417.7	1752.3	1596.6	2484.7	2021	1	14	18	28	18.520	6.1	0	0	88	21	-9.000	0.281
50	-2.949976	118.898644	15.222	-662.8	3129.3	-225.4	1407.8	1608.9	2137.4	2021	1	14	18	25	40.280	3.1	0	0	114	34	-9.000	0.197
51	-2.910905	118.939814	12.356	3914.2	7449.6	-3091.0	1772.5	1432.3	1968.4	2021	1	14	17	22	37.030	2.8	0	0	65	30	-9.000	0.133
52	-2.916683	118.972168	9.431	7511.1	6810.7	-6016.9	3299.3	1723.9	1950.1	2021	1	14	17	1	8.170	2.9	0	0	81	10	-9.000	0.241
53	-2.987638	118.915979	8.590	1264.3	-1035.2	-6857.1	2161.1	1193.9	1578.3	2021	1	14	7	33	56.220	3.8	0	0	119	6	-9.000	0.201
54	-2.963625	118.906310	14.252	189.5	1620.1	-1195.6	1592.2	1335.5	1815.0	2021	1	14	6	51	35.720	2.8	0	0	79	8	-9.000	0.137
55	-2.976182	118.900427	10.687	-464.6	231.5	-4760.2	1280.8	1262.6	1430.8	2021	1	14	6	38	38.670	5.5	0	0	134	35	-9.000	0.220
56	-2.973345	118.888533	13.740	-1786.9	545.2	-1708.0	1624.8	1203.0	2568.2	2021	1	14	6	35	50.170	5.9	0	0	157	13	-9.000	0.249
57	-3.108076	119.093098	12.970	20953.4	-14352.8	-2478.3	2353.3	2197.5	3048.6	2020	12	13	22	4	32.110	2.9	0	0	79	0	-9.000	0.251
58	-2.673905	118.891895	73.402	-1413.3	33656.1	57953.5	3111.0	3209.3	3099.5	2020	10	28	0	6	59.380	2.4	0	0	39	6	-9.000	0.183
59	-2.718456	119.200232	9.749	32868.5	28729.8	-5697.8	1696.2	1808.4	1576.7	2020	10	26	16	57	29.310	2.3	0	0	41	8	-9.000	0.161
60	-2.528251	118.905715	14.683	123.3	49762.0	-764.0	4354.6	2274.7	3572.7	2020	9	26	3	9	43.330	4.9	0	0	37	2	-9.000	0.157
61	-2.543133	118.952514	7.215	5327.0	48116.3	-8231.8	4517.9	2237.9	2985.4	2020	6	28	22	13	56.890	3.0	0	0	39	0	-9.000	0.150
62	-2.524923	118.954445	9.877	5541.6	50129.9	-5570.6	3594.8	1690.9	2512.1	2020	5	30	11	23	23.350	3.2	0	0	37	0	-9.000	0.152
63	-2.917193	119.165942	89.741	29053.6	6754.3	74292.7	5652.4	3911.5	3402.0	2020	4	21	0	39	35.970	2.8	0	0	21	9	-9.000	0.215
64	-3.571470	119.236846	12.250	36924.9	-65593.0	-3197.9	1689.3	2081.9	7171.8	2020	3	15	6	32	31.410	2.5	0	0	28	6	-9.000	0.230
65	-2.761247	118.717268	14.589	-20828.4	23998.2	-858.5	1935.8	3711.8	3846.7	2020	2	12	19	25	33.610	2.1	0	0	34	7	-9.000	0.288
66	-3.650660	119.088052	48.884	20387.2	-74349.5	33435.4	2974.4	3549.1	3237.0	2020	2	6	15	26	53.120	2.5	0	0	37	8	-9.000	0.219
67	-2.653124	119.154302	12.104	27762.6	35954.0	-3343.7	1991.1	2502.8	3216.6	2020	1	22	4	58	30.630	2.7	0	0	39	11	-9.000	0.209
68	-2.871110	118.579828	33.391	-36107.4	11849.9	17943.5	2931.7	2278.9	3275.1	2019	4	23	16	28	7.740	5.0	0	0	55	1	-9.000	0.255
69	-3.176846	118.805032	5.936	-11068.7	-21957.1	-9511.3	1991.0	2535.7	1835.2	2019	3	17	8	38	57.800	2.8	0	0	69	20	-9.000	0.319
70	-2.989529	119.116266	8.780	23530.1	-1244.3	-6668.4	2221.9	2392.1	2165.9	2019	3	12	15	18	39.040	4.1	0	0	56	2	-9.000	0.312
71	-2.990345	119.140088	12.897	26178.4	-1334.5	-2550.3	2877.4	3074.5	2846.9	2019	3	3	20	17	11.180	3.0	0	0	47	0	-9.000	0.147
72	-3.442309	118.977960	12.981	8153.0	-51310.9	-2467.3	2242.2	2353.3	2470.9	2019	2	22	15	52	28.330	2.2	0	0	40	9	-9.000	0.233
73	-3.051392	118.490037	15.392	-46086.2	-8084.9	-56.6	2408.5	2781.6	3224.3	2019	2	6	4	23	40.880	4.7	0	0	62	13	-9.000	0.285
74	-2.956254	118.717917	9.892	-20754.5	2435.1	-5555.5	1628.1	1869.1	2448.1	2018	12	3	19	0	42.190	2.7	0	0	77	17	-9.000	0.202
77	-3.427939	119.166746	45.993	29136.0	-49722.0	30544.9	2751.1	2666.8	2753.9	2018	10	1	8	18	32.330	3.4	0	0	34	2	-9.000	0.196
80	-2.717013	118.921588	20.336	1888.1	28889.4	4888.2	2408.5	1914.1	2631.6	2018	6	8	21	28	35.430	4.5	0	0	52	0	-9.000	0.242
81	-2.775700	118.974679	23.309	7790.7	22400.1	7860.9	3558.3	2417.4	3162.2	2018	6	8	13	8	10.110	4.7	0	0	50	0	-9.000	0.246
82	-3.307616	118.660125	11.767	-27174.9	-36417.1	-3680.1	2473.5	2682.6	3591.3	2018	3	25	6	20	31.440	4.0	0	0	60	14	-9.000	0.339
83	-3.009589	118.576453	7.342	-36480.3	-3462.5	-8105.4	3401.5	3772.3	2398.2	2018	1	8	8	26	8.440	2.6	0	0	48	0	-9.000	0.202
84	-2.635708	119.201390	6.052	32998.4	37879.8	-9395.7	1897.9	2498.1	2807.9	2018	1	4	6	44	16.690	2.6	0	0	40	11	-9.000	0.308
85	-3.470189	119.057742	33.613	17020.2	-54393.7	18164.3	2610.7	2548.8	3161.5	2018	1	1	9	17	58.020	4.6	0	0	42	0	-9.000	0.171
86	-2.891918	118.734374	12.352	-18925.4	9549.2	-3095.9	1778.2	1890.8	1994.6	2017	11	1	8	42	22.080	3.1	0	0	71	20	-9.000	0.249
87	-2.785669	118.570798	28.487	-37112.6	21297.7	13039.0	2742.7	2713.9	4156.0	2017	10	16	20	36	9.860	3.0	0	0	55	16	-9.000	0.388

Lampiran 9 Script pembuatan Diagram kompas

```
close all;
clear all;
clc
%menghitung besar perubahan jarak (km) antara hiposenter sebelum direlokasi
%dengan sesudah direlokasi, Menghitung besar perubahan sudut azimuth.
%membentuk diagram rose dan diagram compas%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

lawal = importdata('Latawal.txt');
lrelok1 = importdata('latakhir.txt');
%lrelok2 = importdata('lintangrelok2.txt');
bawal = importdata('longawal.txt');
brelok1 = importdata('longakhir.txt');
%brelok2 = importdata('bujurrelok2.txt');
b1 = (bawal-brelok1)*111;
l1 = (lawal-lrelok1)*111;
%b2 = (bawal-brelok2)*111;
%l2 = (lawal-lrelok2)*111;

%%skenario___________1%%
%%%kuadran
1;%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%%%%%%%%%%%%
a11= b1>0 & l1>0;
b11= b1(a11);
l11= l1(a11);
r11= ((b11.^2)+(l11.^2)).^0.5;
y11 = asind(sqrt(b11.^2)./r11);
theta11 = y11;
```

```

%%%kuadran
3;%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%%%%%%%%%%%%
a31= b1<0 & l1<0;
b31= b1(a31);
l31= l1(a31);
r31= ((b31.^2)+(l31.^2)).^0.5;
y31 =asind(sqrt(b31.^2)./r31);
theta31 = 180 + y31;

%%%kuadran
2%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%%%%%%%%%%%%
a21= b1>0 & l1<0;
b21= b1(a21);
l21= l1(a21);
r21= ((b21.^2)+(l21.^2)).^0.5;
y21 =asind(sqrt(l21.^2)./r21);
theta21 = 90 + y21;

%%%kuadran
4%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%%%%%%%%%%%%
a41= b1<0 & l1>0;
b41= b1(a41);
l41= l1(a41);
```

```
l41= l1(a41);
r41= ((b41.^2)+(l41.^2)).^0.5;
y41 =asind(sqrt(l41.^2)./r41);
theta41 = 270 + y41;

%%SKENARIO 1%%----------------------------
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
r1 = [r11;r21;r31;r41];
alpha1 = [theta11;theta21;theta31;theta41];
a1 = alpha1;

%%SKENARIO
1%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%%%%%%%%%%%%
figure (11)
g= rose (a1);
title('Diagram Rose')

%%SKENARIO
1%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%%%%%%%%%%%%
figure(12)
rdir = a1 * pi/180;
[x1,y1]= pol2cart (rdir,r1);
jk= compass (x1,y1);
view(90,-90)
title('Compass Diagram')
```