MkII Airborne Laser Fluorosensor Survey Reprocessing And Interpretation Report: Timor Sea, Australia

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Summary

The Timor Sea airborne laser fluorosensor (ALF) MkII survey was flown in 1989 by BP over the western Bonaparte Basin (Vulcan Sub-basin and Nancar Trough). The survey was designed to detect natural oil seepage over a region of the Timor Sea, Australia, in an effort to refine the petroleum prospectivity assessment.

An irregular area spanning 300km by 300km was surveyed at 5km line spacing. A total of 439,972 fluorosensor spectra were recorded.

This report presents a re-interpretation of the BP data by Signalworks Pty Ltd using the *ALF Explorer™* software. A total of 392 fluors were picked out of the 439,972 recorded spectra in the final interpretation. This is an average fluor density of 0.89 fluors per thousand spectra.

The fluorescence response over most of the survey area consisted mainly of relatively low confidence fluors (compared to the more reliable MkIII survey data). A patch of very strong fluors was located over the Jabiru Field. The anomalous intensity and distribution of these fluors suggests they are related to the field development rather than natural oil seepage.

While fluor density variations can be seen on the fluor map the geological implications are not clear. Because of its susceptibility to noise, the MkII ALF system produces less confident fluor maps than the MkIII system. Some mapped fluor density variations may be influenced by sea state or water property variations.

1. Introduction

The Timor Sea airborne laser fluorosensor (ALF) MkII survey was flown in 1989 by BP over the western Bonaparte Basin (Vulcan Sub-basin and Nancar Trough). The MkII system used a 308nm laser wavelength, longer than the 266nm used in the later MkIII system. The Raman peak wavelength is 344nm (293nm MkIII) and the fluorescence region is 370nm to 580nm (320nm to 580nm MkIII).

Each recorded spectrum is the average of ten detected spectra. The averaging was done by BP to reduce the data recording rate, which was limited by the available 1980's hardware. The MkIII system uses faster hardware and records all detected spectra without averaging.

This report presents a re-interpretation of the original BP data using the *ALF Explorer™* software that consists of a database linked to a set of data processing, analysis and display modules. BP documented the original data processing and interpretation in a report by Williams and Mackintosh (1990*).

67 lines were acquired at 5,000m spacing in a NW-SE orientation and a flying height of 100m. A total of 439,808 spectra were collected at an average spacing of 14.9m to 19.6m. 7,530km of line data were acquired.

Some lines in a MkII ALF survey may use the same Line and Point values as other lines. The main ALF data table in the *ALF Explorer* database (RawAlfData) uses the Line and Point fields as key fields, which cannot contain duplicates. Lines that contain duplicated Line and Point values will be stored in a separate table (eg. RawAlfData2).

The main ALF data table contains 436,972 ALF spectra. A second table, RawAlfData2, contains 2,836 ALF spectra.

The survey area is shaded in red on the location map (Figure 1). Seven MkIII ALF surveys acquired between 1995 and 1998 in this region are shown with blue shading and are re-interpreted in the reports Cowley (2000a-g* and 2001a*). Other MkII ALF surveys are shaded in light green (Cowley 2001b-d*).

A total of 392 fluors were interpreted out of the 439,972 recorded spectra. This is an average fluor density of 0.89 fluors per thousand spectra. 68 of these are located in a single patch near the Jabiru Field. This patch contains many very large fluors. If the Jabiru fluors are excluded, the average fluor density is reduced to 0.74 fluors per thousand spectra.

* Bibliographic references:

Williams, A.K. and Mackintosh, J.M., 1990. ALF Survey of the western margin of Australia. 4. Browse Basin. Volume 1, A – Basic Data Report; Volume 2, B – Interpretive Data Report; Volume 3, C – BP In-house Report. Remote Sensing Group, BP Exploration (unpubl. report).
Cowley, R., 2000a. Comparison of AGSO – Geoscience Australia North-West Shelf Airborne Laser Fluorosensor Survey Interpretations. Record 2000/27.
Cowley, R., 2000b. 1996 Nancar Trough, Northern Bonaparte Basin (AC/P16) Airborne Laser Fluorosensor Survey Interpretation Report. Record 2000/28.
Cowley, R., 2000c. 1996 Laminaria High, Northern Bonaparte Basin (AC/P8) Airborne Laser Fluorosensor Interpretation Report. Record 2000/29.
Cowley. R., 2000d. 1998 Yampi Shelf, Browse Basin Airborne Laser Fluorosensor Survey Interpretation Report. Record 2000/30.
Cowley. R., 2000e. 1996 Yampi Shelf, Browse Basin Airborne Laser Fluorosensor Survey Interpretation Report. Record 2000/31.
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Cowley. R., 2000g. 1996 Vulcan Sub-basin Airborne Laser Fluorosensor Survey Interpretation Report. Record 2000/33.
Cowley. R., 2001a. Airborne Laser Fluorosensor (MkIII) Survey Reprocessing and Interpretation Report: WA-260-P, Timor Sea, Australia. Record 2001/17, AGSOCAT 35929.
Cowley. R., 2001b. MkII Airborne Laser Fluorosensor Survey Reprocessing and Interpretation Report: Timor Sea, Australia. Record 2001/23, AGSOCAT 34394.
Cowley. R., 2001c. MkII Airborne Laser Fluorosensor Survey Reprocessing and Interpretation Report: Bonaparte Basin, Timor Sea, Australia. Record 2001/24, AGSOCAT 35930.
Cowley. R., 2001d. MkII Airborne Laser Fluorosensor Survey Reprocessing and Interpretation Report: Timor Gap, Timor Sea, Australia. Record 2001/25, AGSOCAT 35635.

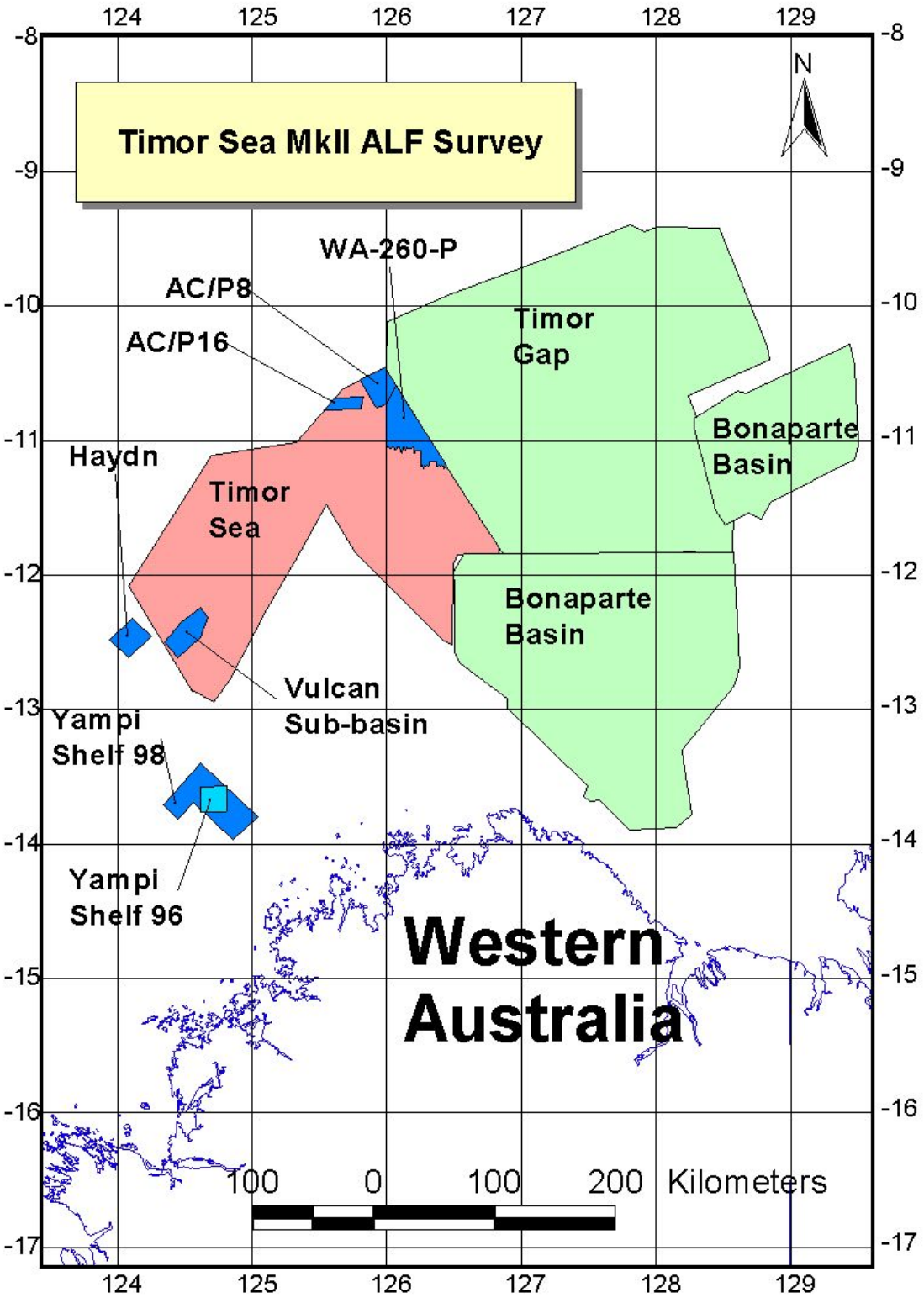


Figure 1. Timor Sea MkII ALF Survey Location Map.
(The Timor Sea survey is shaded in red.)
(Blue areas are later MkIII ALF surveys.)
(Light green areas are other MkII ALF surveys.)

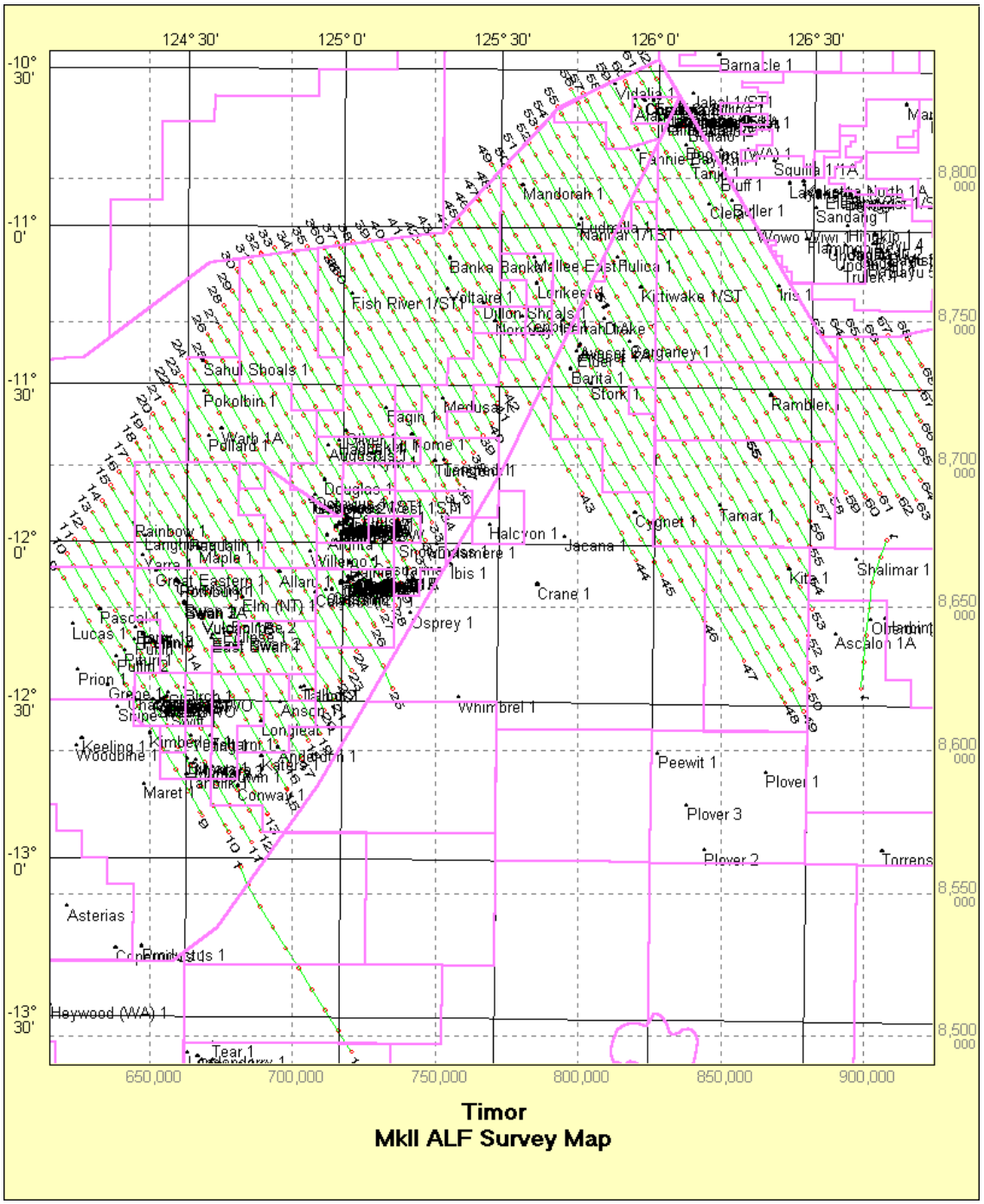


Figure 2. The Timor Sea MkII ALF Survey.

Figure 2 shows a map of the Timor Sea MkII ALF survey with point symbols annotated in red at a spacing of 500 points.

Mapping Specifications:
The geodetic coordinates of the supplied ALF data used the AGD66 geodetic datum. Because of inconsistencies in the AGD66 datum, there is no single set of transformation parameters that can accurately transform the coordinates into the WGS84 or AGD84 datums. The AGD66 datum coordinates were assumed to be approximately equal to the AGD84 coordinates for the accuracy of mapping required in this report.

Projection: Southern UTM Zone 51 (Central Meridian 123 degrees east)

Min Easting:	615,000
Max Easting:	925,000
Min Northing:	8,490,000
Max Northing:	8,845,000

2. ALF Survey Analysis

2.1. Fluor Mapping

A fluorescence anomaly (fluor) is detected by an increase in the area of the fluorescence response region of the ALF spectrum. For a variety of reasons the magnitude of each ALF spectrum can vary significantly from shot to shot. The fluorescence area value is usually normalized using the Raman area to produce a more consistent measure of fluorescence intensity. The ratio is called the fluorescence on Raman area ratio, usually denoted as F/R.

In this analysis, the Raman area is calculated between the wavelengths 330.77nm and 360.13nm (channels 26 to 54). The fluorescence area is calculated between the wavelengths 360.13nm to 600.83nm (channels 54 to 154). Oil fluorescence usually extends over the Raman region but the Raman response distorts the value if it is calculated over this region.

The F/R ratio typically shows varying intensity trends over a survey area, probably because of changing water properties. A map of the averaged F/R ratio over the Timor Sea survey is shown in Figure 15 (Appendix 1). The F/R ratio generally increases to the south and east. Localized increases in the ratio are usually seen consistently over several lines.

Figure 3 shows the F/R plot for line 46 showing a local high near the middle of the line (points 26,500 to 27,500) and an increased level to the south (points 31,500 and higher).

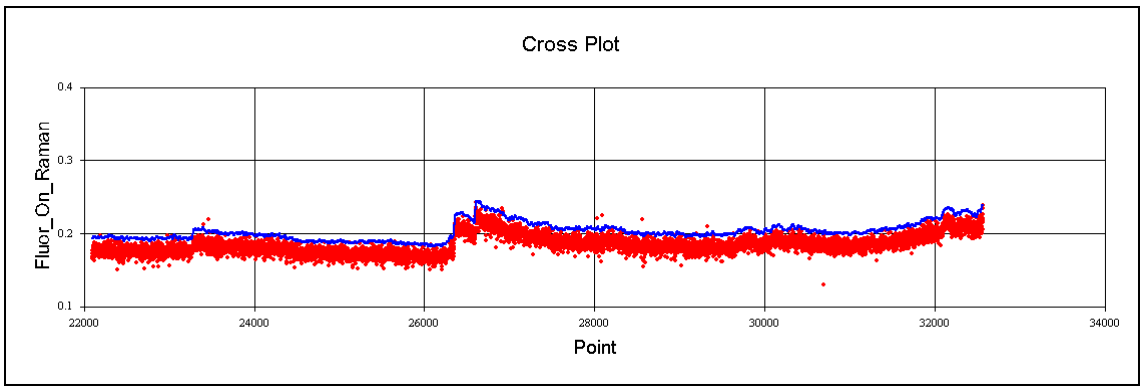


Figure 3. The F/R Plot for Line 46.

Because of the changing F/R trends, a constant F/R cutoff level cannot be used to detect fluorescence anomalies (fluors). An average of the F/R ratio is used as an estimate of the background F/R level at any point. Only spectra having an F/R value significantly above the background level are selected as possible fluors.

The blue line shown in Figure 3 is the (21 point) average F/R rescaled by a factor of 1.1. The rescaling moves the averaged curve above the F/R values of most of the spectra. Only spectra having an F/R value above the blue curve are selected as possible fluors. The scaling factor is usually selected between

values of 1.05 and 1.5 for each line depending on the amount of scatter in the F/R plot.

Many high F/R values are caused by noise in the spectrum so the final step in fluor picking is editing out the noisy records. This can be done by selecting fluors in the map view and displaying their spectra. Noisy spectra are usually easy to recognize and are deleted from the selected fluor tables. If there are relatively few fluors picked, they can all be checked for noise by viewing each spectrum in the selected fluor table.

The number of fluors picked on a particular line is very dependent on the variance in the F/R values and the scaled background level used in the fluor detection. Figure 4 shows the F/R plot for Line 61. Because of the high variance in values, the background cutoff value needed to be raised so that the detected fluors had a reasonable confidence level.

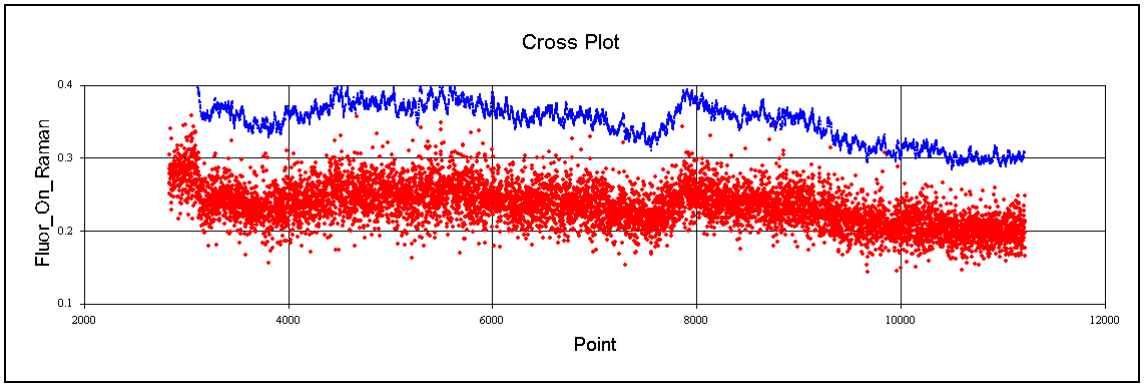


Figure 4. The F/R Plot for Line 61.

Figure 5 shows a map of the confident fluors that remain after the noisiest records have been edited from the initial picks. 392 fluors were selected out of a total of 439,808 recorded spectra. Although they are described as “confident” fluors, the confidence is much lower than the fluor picks on the later MkIII data.

Many very high intensity fluors lie in the patch near the Jabiru Field. The confident fluor map shown in Figure 6 excludes the Jabiru fluors and is scaled to show the remaining fluor intensities in more detail.

Any laterally extensive oil patch should produce adjacent fluors in the interpreted data. A module included in the *ALF Explorer* software package detects adjacent fluors in the picked spectra. Excluding the Jabiru cluster, no adjacent fluors were found.

Because the MkII ALF data averages ten adjacent spectra during recording, the confidence in picking isolated and low intensity fluors is greatly reduced. A comparison of MkII and MkIII ALF data is included in Appendix 3 of this report. Even a medium intensity isolated fluor, easily identified on MkIII data, becomes difficult to distinguish from the background response after ten adjacent spectra are summed.

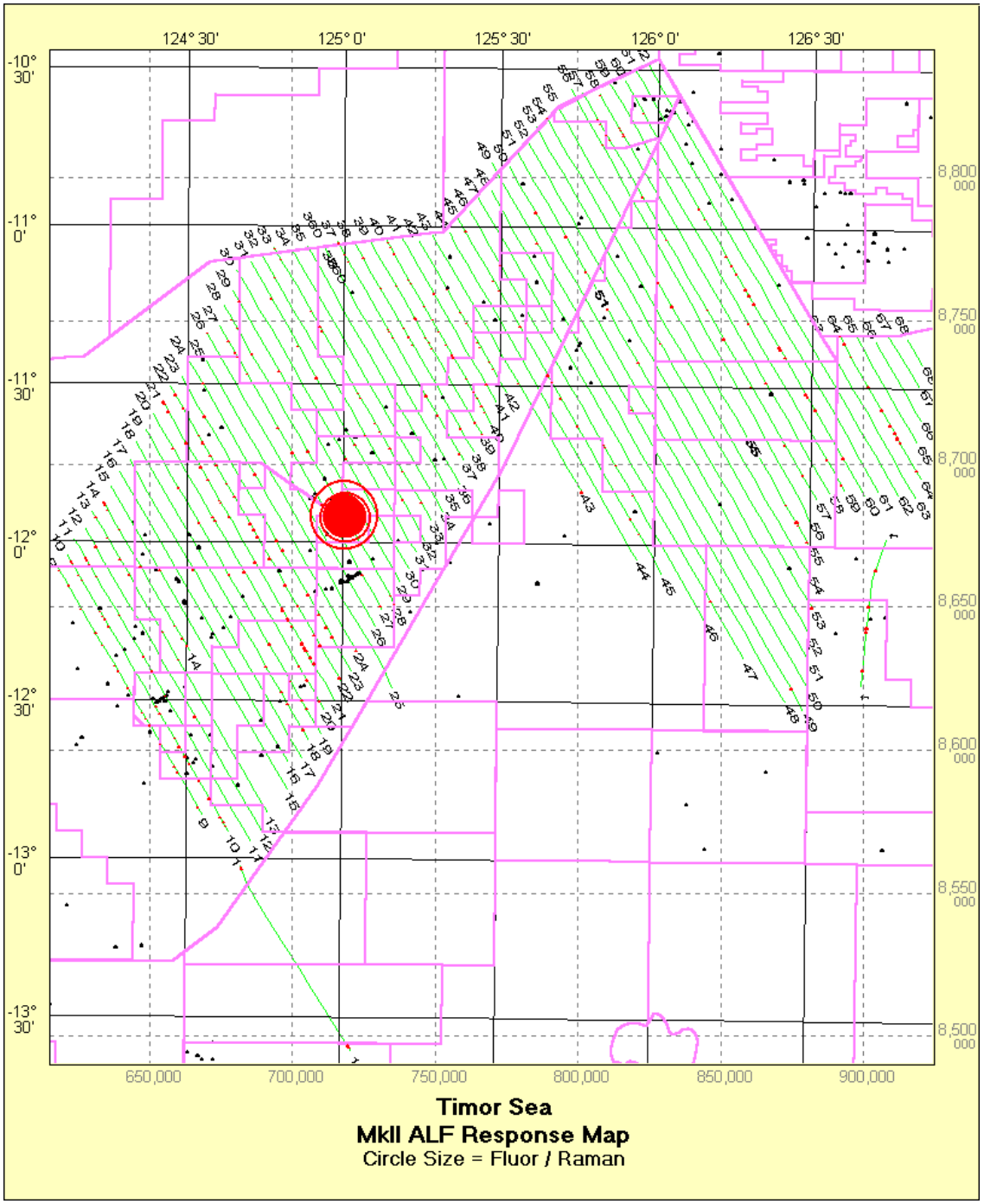


Figure 5. The Timor Sea MkII ALF Survey Confident Fluor Map.

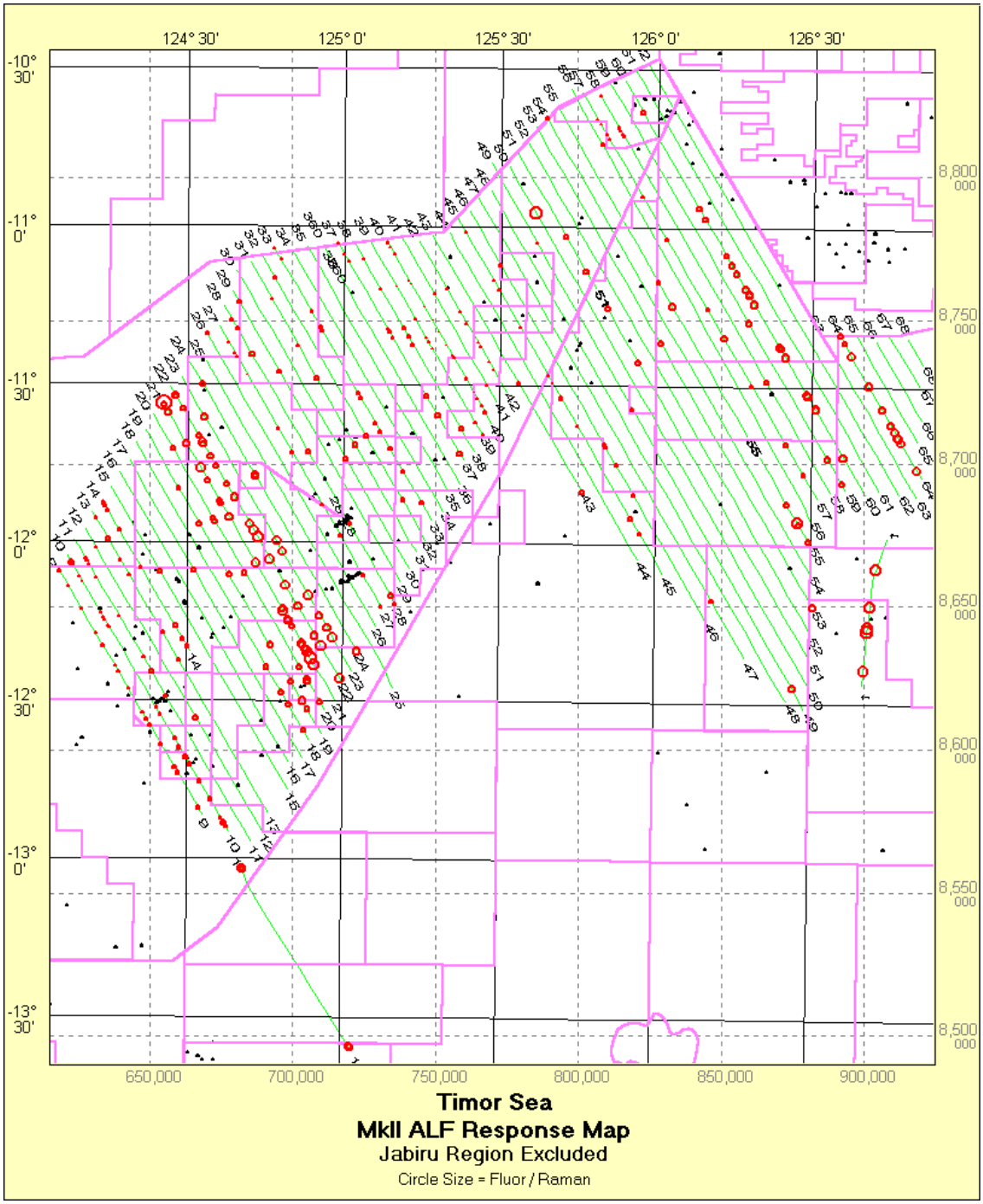


Figure 6. The Timor Sea MkII ALF Survey Confident Fluor Map (Jabiru Region Excluded).

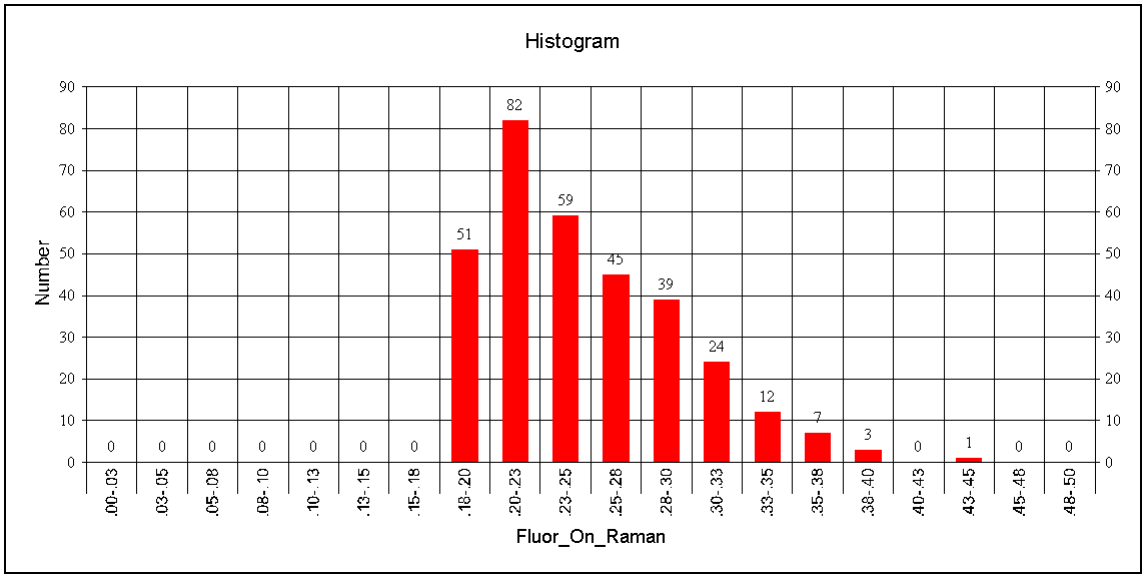
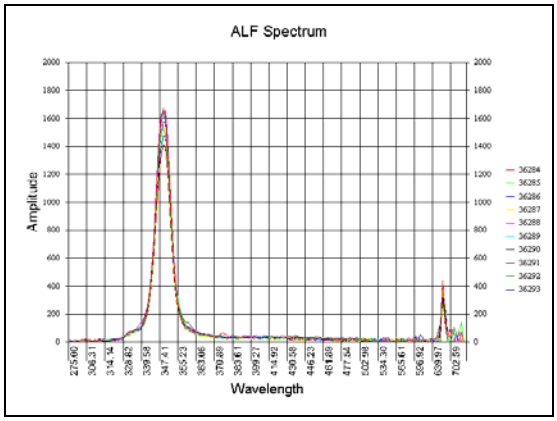
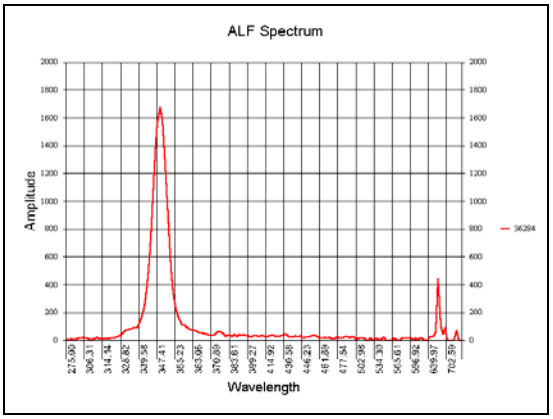


Figure 7. The F/R Histogram Plot for the Picked Fluors (Jabiru Region Excluded).

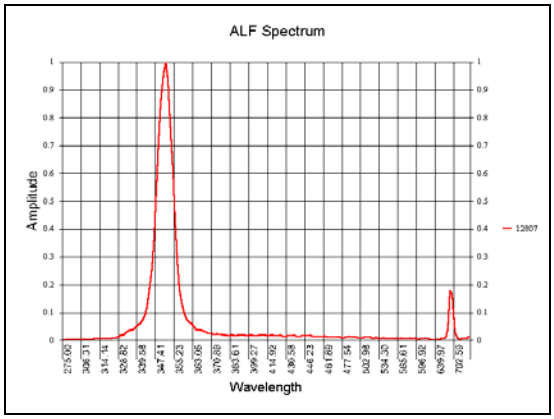
The F/R area histogram of the selected fluors is shown in Figure 7. (The Jabiru fluors are excluded from this plot.) This display provides some indication of the intensity range of the picked fluors but will be distorted by the background F/R variations seen in the survey area (see Figure 15.) MkII ALF data appears to be more affected by the background variations than the MkIII data.



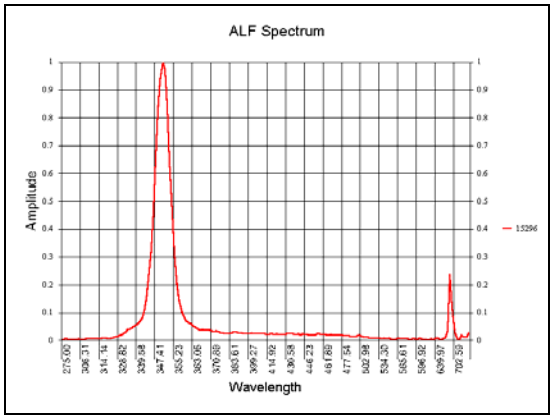
a) Line 15 Ten Adjacent Spectra.



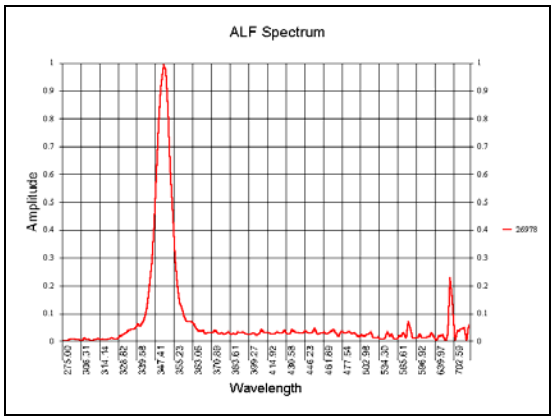
b) Line 15 No Fluor



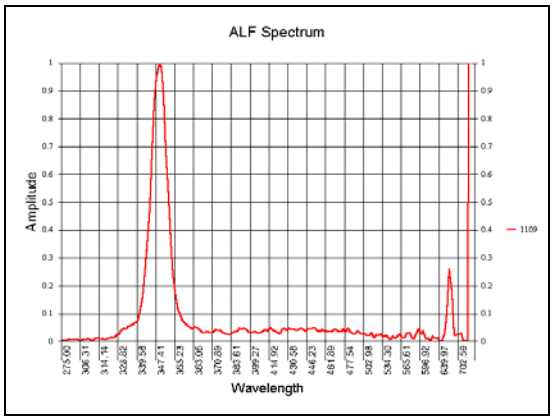
c) Line 39 Small Fluor



d) Line 10 Small to Medium Fluor



e) Line 21 Medium Fluor.



f) Line 1 Large Fluor.

Figure 8. Timor Sea MkII ALF Survey, Selected Spectra.

Figure 8 shows a selection of spectra from the Timor Sea survey. Figure 8a shows a set of ten adjacent spectra on line 15. Because each recorded spectrum is the average of ten measured spectra, the variation in Raman peak is reduced. Figure 8b shows a single non-fluor spectrum. Figures 8c to 8f show picked fluors of increasing intensity. The high intensity fluor shown in Figure 8f has a much lower fluorescence area than is typically picked on an ALF MkIII survey.

2.2 Jabiru Fluor Mapping.

A cluster of large fluors is found on line 28 near the Jabiru Field. Figure 9 shows a detailed map of the Jabiru fluors. Figure 10 shows a detailed plot of the F/R values of points over the anomalous zone.

Selecting records having an F/R value above the background level does not work well in areas like this having many adjacent fluors. Fluorescing records probably extend over the range between points 27,026 to 27,093. The following SQL query was used to select these 68 records:

SELECT * FROM [RawAlfData] WHERE Line = 28 AND Point >= 27026 AND Point <= 27093

Line 28 is separated into four segments between points 27052 and 27056. The spacing between points 27,052 and 27053, 27053 and 27,054, 27,055 and 27056 is greater than 100m, which was used during processing to specify a new line segment. The gaps in the line may be caused by noise or errors in the navigation system.

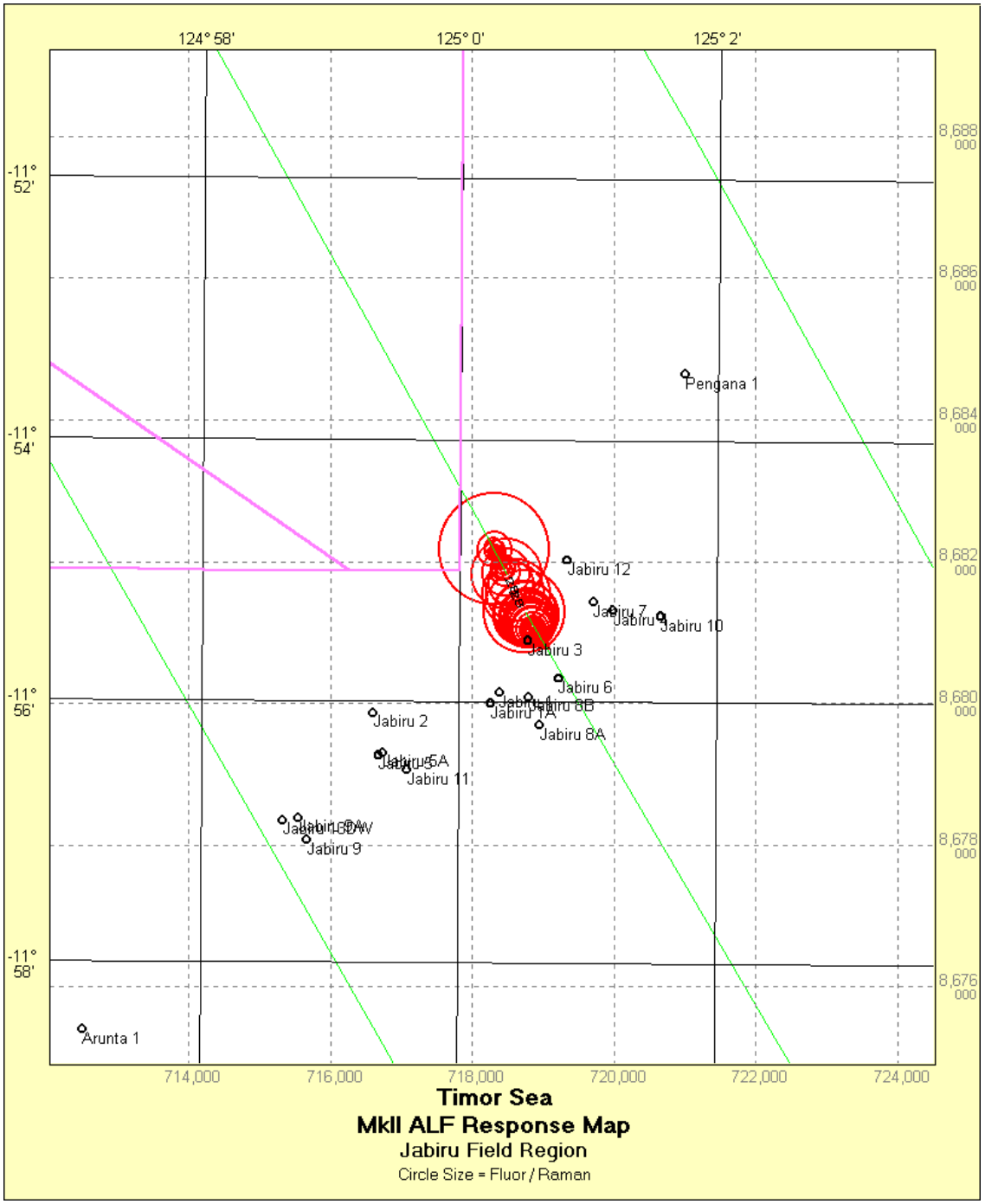


Figure 9. High Intensity Fluors Near the Jabiru Field.

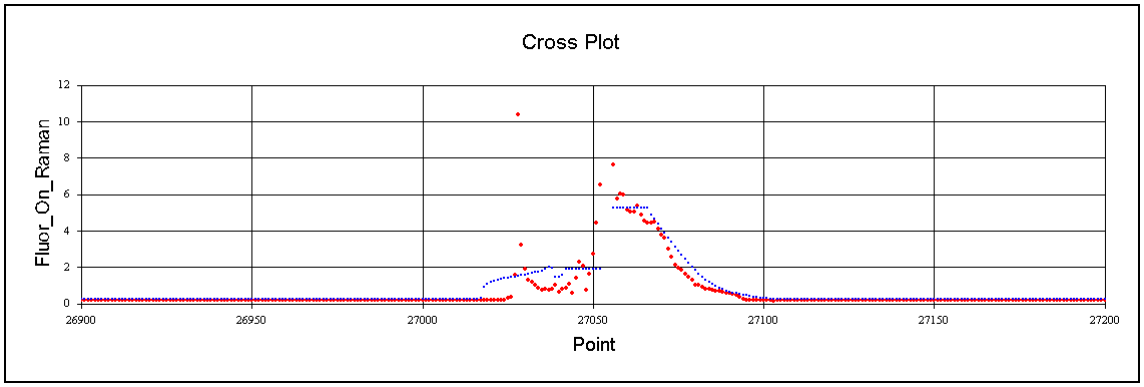


Figure 10. Line 28 F/R Plot Near the Jabiru Field.

The F/R histogram for the 68 Jabiru region fluors is shown in Figure 11. The fluor intensity, as measured by the F/R ratio, ranges from 0.37 to 10.38. The highest intensity fluor, excluding the Jabiru region, had an F/R value of 0.44.

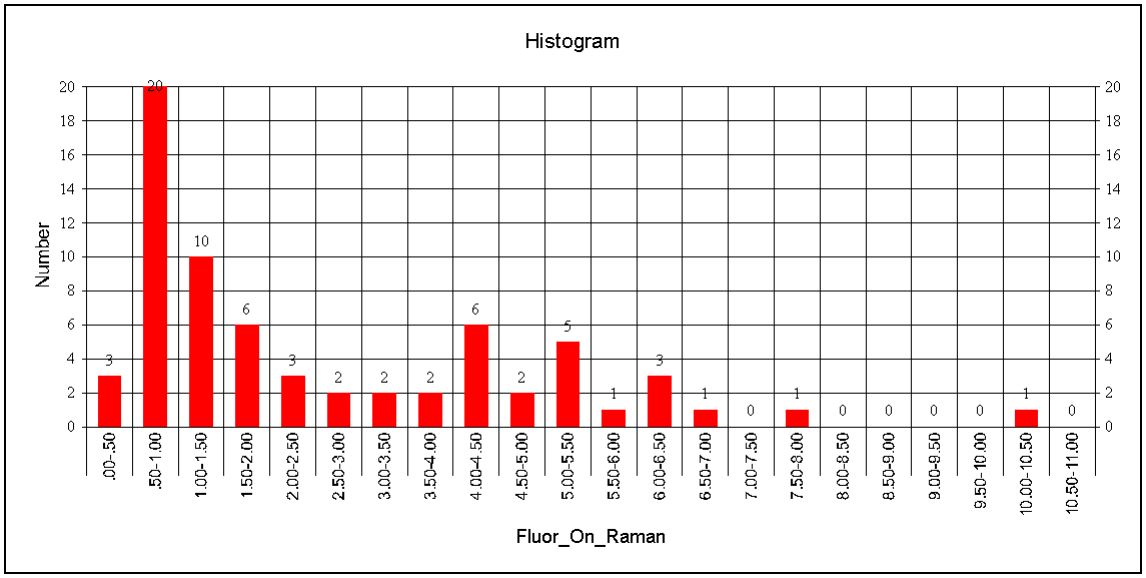
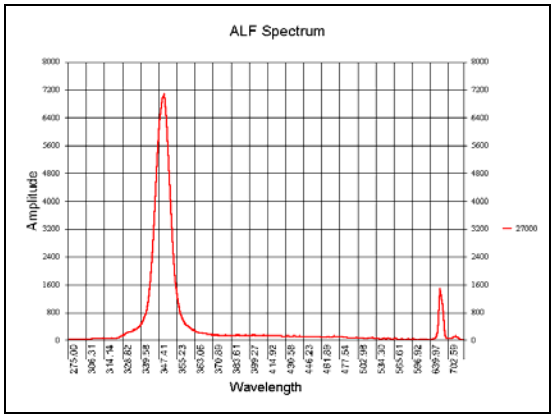
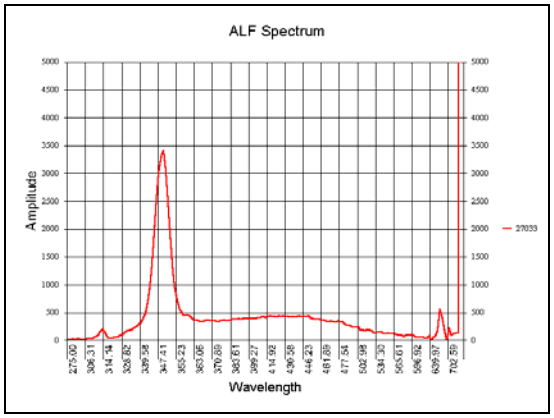


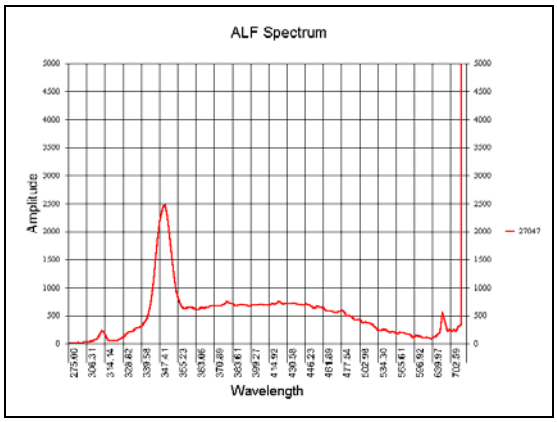
Figure 11. Jabiru Fluor Histogram.



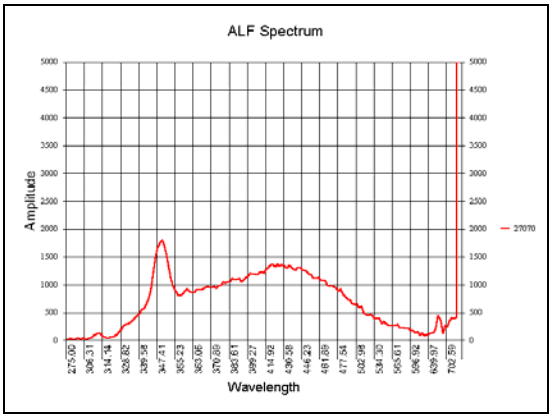
a) Line 28 No Fluor.



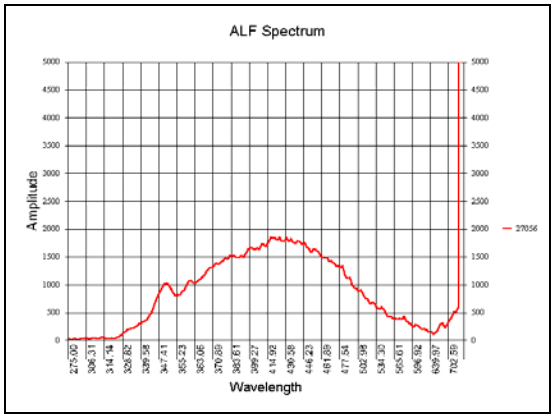
b) Line 28 Small Fluor.



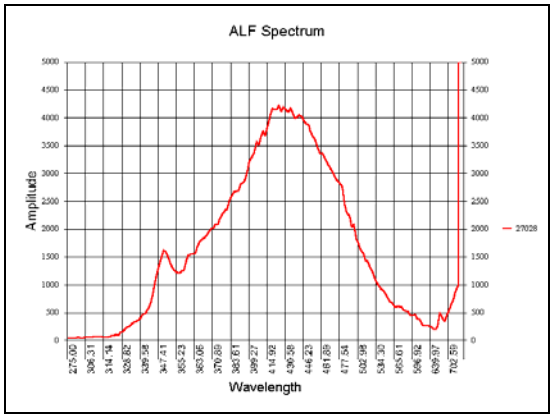
c) Line 28 Small to Medium.



d) Line 28 Medium Fluor.



e) Line 28 Medium to Large Fluor.



f) Line 28 Large Fluor.

Figure 12. Large Fluors from Line 28 in the Jabiru Region.

Figure 12 shows a selection of spectra and fluors on line 28 near the Jabiru seepage anomaly. Figure 8a shows a non-fluor spectrum. Figures 12b to 12f show fluors of increasing intensity. The Raman peak becomes relatively small through the seepage region. The slick causing the fluors is probably wide and continuous enough that many of the adjacent detected spectra are showing fluorescence. In that case, the averaging process used for recording the data will enhance the fluorescence response.

3. Conclusions and Recommendations

The strongest fluors found on the Timor Sea MkII ALF survey were located over the Jabiru Field. The anomalous intensity and distribution of these fluors suggests they are related to hydrocarbon production from the field rather than to natural oil seepage.

Apart from the Jabiru anomaly, the fluorescence response over the survey area consisted mostly of relatively low confidence fluors, at least compared to the more sensitive MkIII ALF survey data.

The 10 spectra averaging method used to record the MkII data tends to filter out the isolated fluorescence response and enhance anomalous water responses.

The 5km line spacing is not sufficiently close to detect most fluor clusters. For example, the line spacing of 300m used on the nearby MkIII ALF survey over the Skua field, Timor Sea (Cowley, 2000*), was only just sufficient to detect the fluor cluster lying near that accumulation.

The Timor Sea ALF MkII data is probably not suitable for identifying the isolated, low intensity fluors that are usually detectable on ALF MkIII surveys in the region.

*Bibliographic reference:
Cowley. R., 2000. 1996 Vulcan Sub-basin Airborne Laser Fluorosensor Survey Interpretation Report. Record 2000/33.

Appendix 1. Data Acquisition QC

Line	Sections	Clipped	Avg Raman Peak	Avg Raman Variance
1	43	0	29.00	22.00
9	57	0	25.00	14.00
10	68	0	22.00	13.00
11	69	0	20.00	11.00
12	72	0	19.00	11.00
13	68	0	18.00	10.00
14	36	0	18.00	10.00
15	65	0	12.00	9.00
16	58	0	12.00	10.00
17	73	0	12.00	10.00
18	66	0	12.00	8.00
19	75	0	13.00	9.00
20	67	0	15.00	9.00
21	72	0	10.00	7.00
22	65	0	9.00	7.00
23	71	0	9.00	6.00
24	66	0	11.00	7.00
25	74	0	28.00	22.00
25	2	0	34.00	28.00
26	71	0	34.00	24.00
27	67	0	35.00	24.00
28	51	0	30.00	22.00
28	0	0	0.00	0.00
28	0	0	0.00	0.00
28	21	0	29.00	22.00
29	68	0	25.00	16.00
30	77	0	31.00	20.00
31	66	0	30.00	18.00
32	74	0	27.00	16.00
33	62	0	21.00	12.00
34	68	0	27.00	16.00
35	55	0	28.00	16.00
36	53	0	24.00	16.00
37	50	0	34.00	31.00
38	56	0	43.00	39.00
39	44	0	44.00	40.00
40	49	0	42.00	38.00

Table 1a. Timor Sea ALF MkII Survey Data Acquisition Summary.

Line	Sections	Clipped	Avg Raman Peak	Avg Raman Variance
41	37	0	40.00	35.00
42	40	0	38.00	31.00
43	56	0	28.00	15.00
44	83	0	32.00	18.00
45	78	0	31.00	17.00
46	104	0	30.00	16.00
47	94	0	34.00	20.00
48	115	0	31.00	18.00
49	128	0	37.00	32.00
50	136	0	34.00	30.00
51	116	0	23.00	12.00
52	121	0	24.00	11.00
53	109	0	21.00	14.00
54	118	0	22.00	14.00
55	100	0	31.00	28.00
56	101	0	31.00	26.00
57	90	0	15.00	9.00
58	95	0	12.00	7.00
59	83	0	15.00	11.00
60	90	0	13.00	10.00
61	83	0	14.00	12.00
62	90	0	11.00	9.00
63	36	0	24.00	15.00
64	34	0	19.00	10.00
65	24	0	13.00	7.00
66	18	0	12.00	5.00
67	11	0	11.00	5.00
68	5	0	11.00	5.00
360	2	0	25.00	55.00
1	27	0	15.00	14.00

Table 1b. Timor Sea ALF MkII Survey Data Acquisition Summary (cont).

The average Raman peak levels (averaged over each line) ranged from 9 to 44. This parameter is mapped over the survey in Figure 13.

The Raman variance, calculated over 100 point windows and averaged over each line, ranged from 5 to 55. This parameter is mapped over the survey in Figure 14.

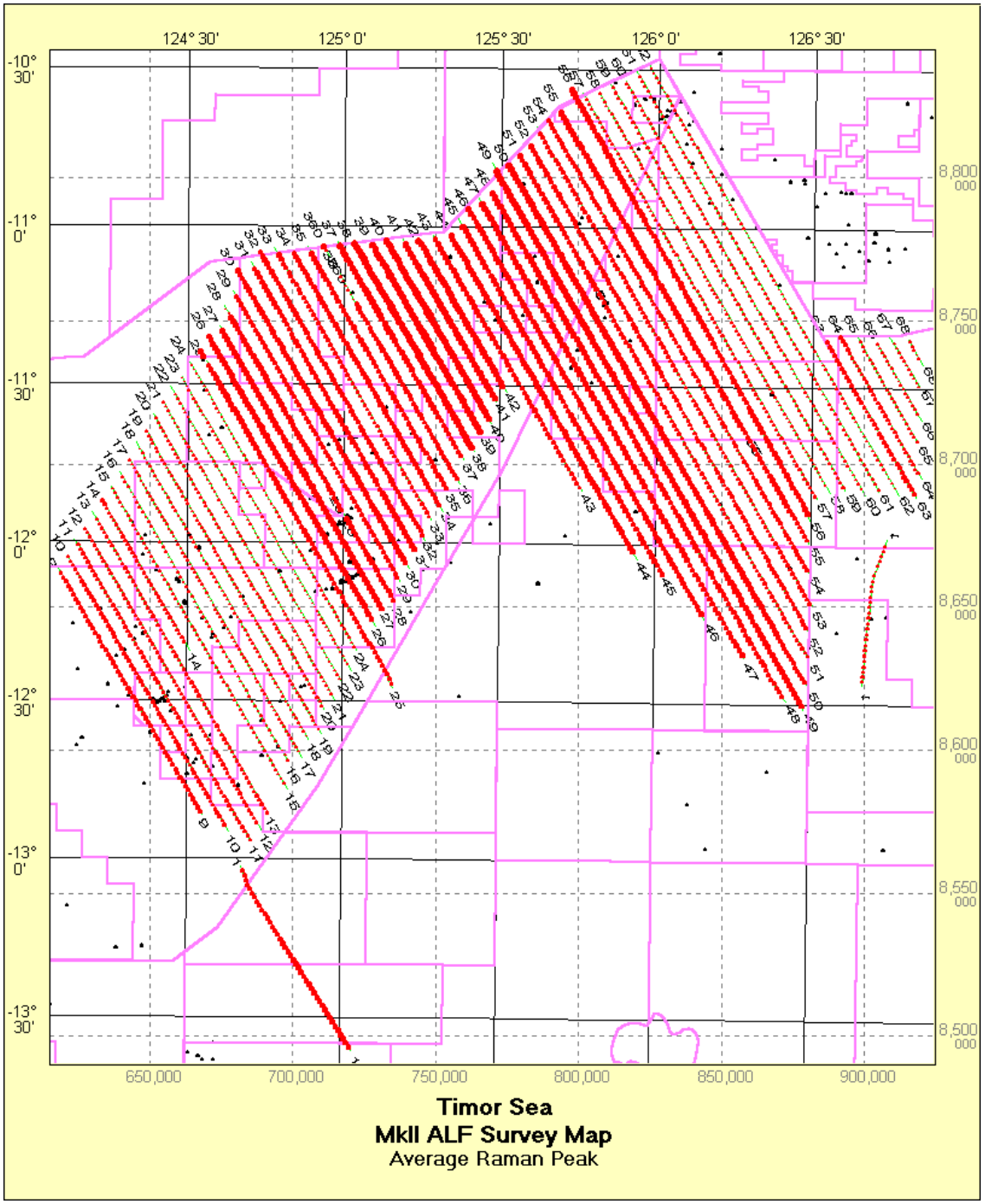


Figure 13. Average Raman Peak Map.

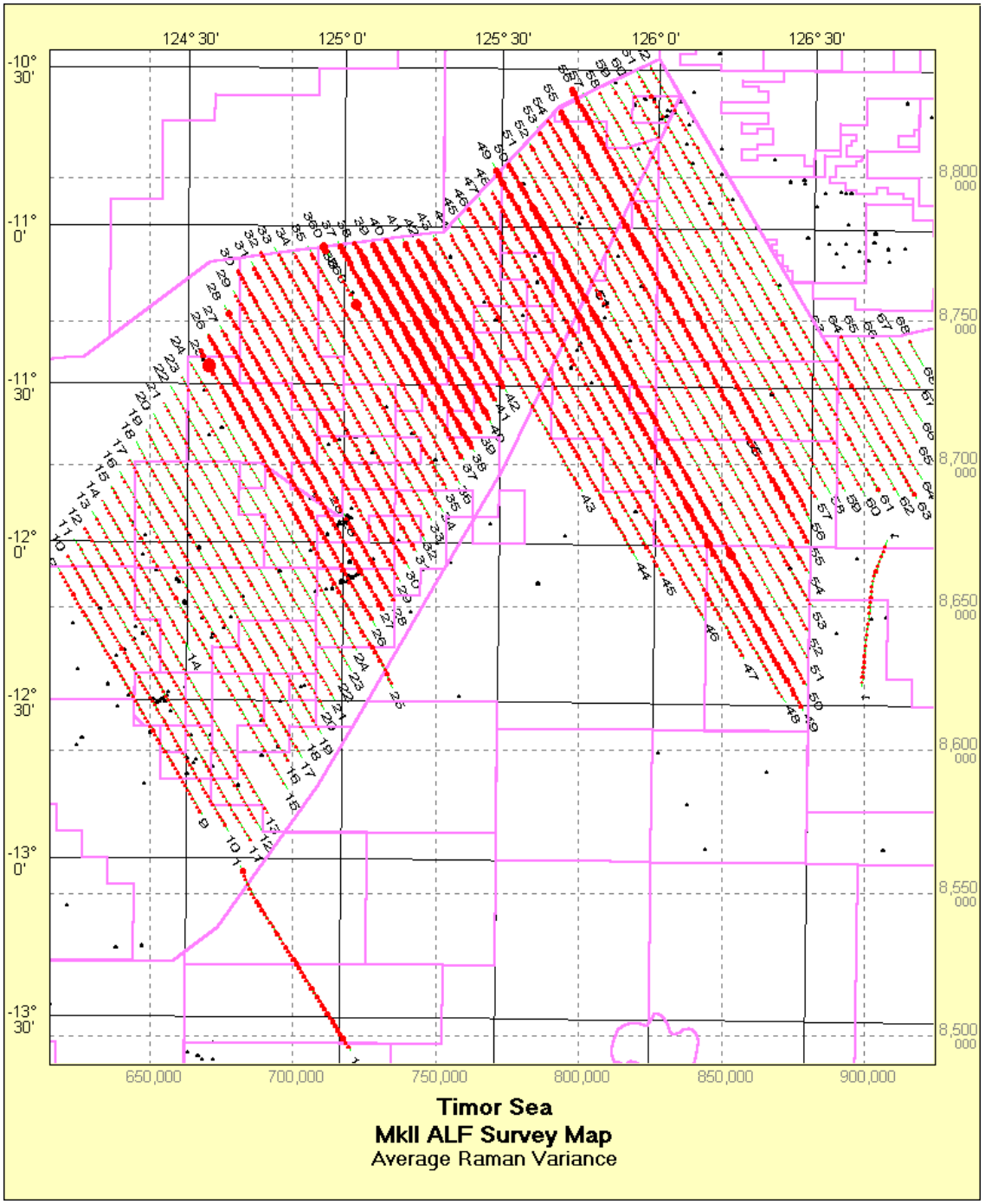


Figure 14. Raman Variance Map.

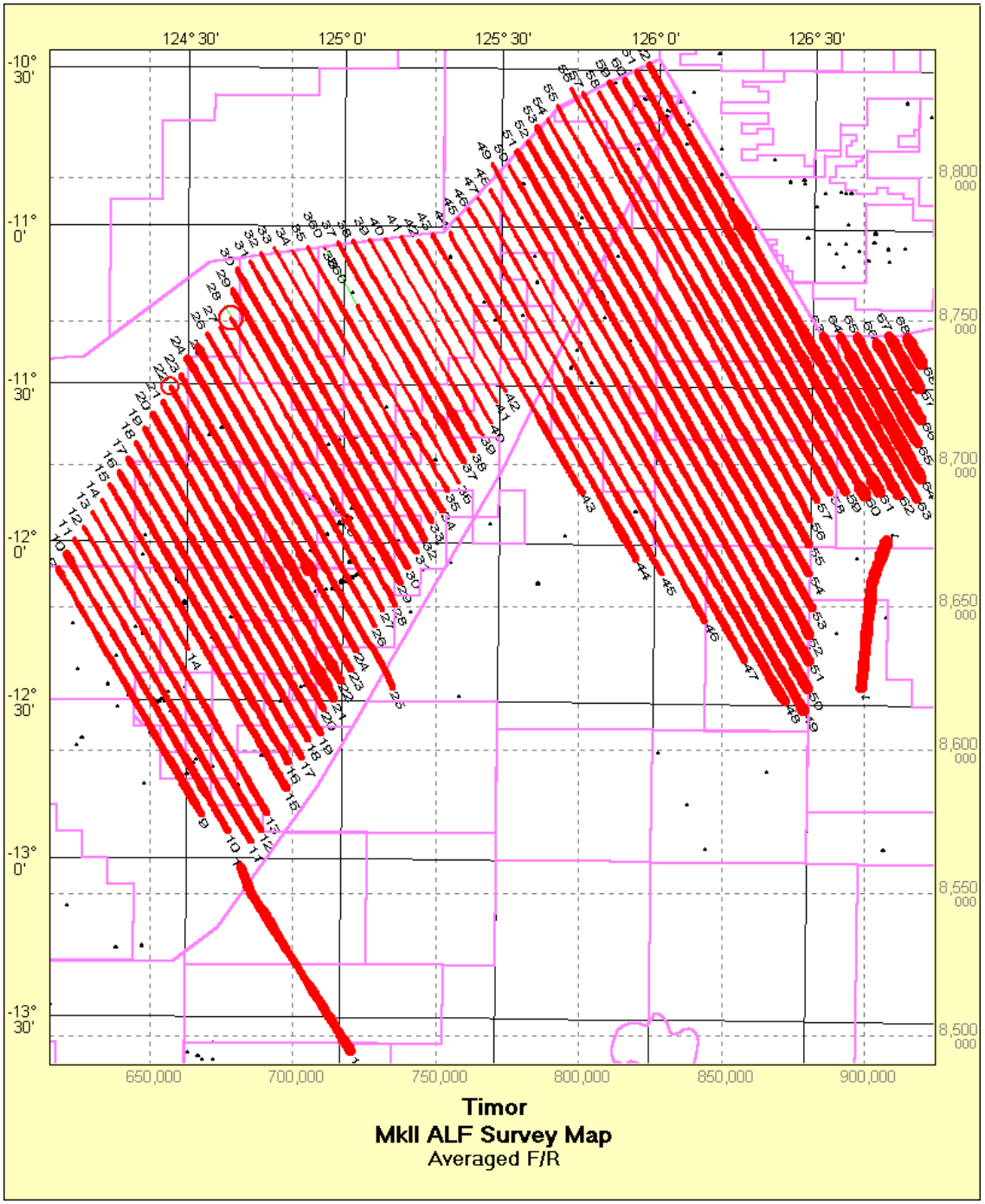


Figure 15. Smoothed F/R Map.

Figure 15 shows the smoothed F/R value over the survey area. The map shows F/R variations that can be correlated between lines.

Appendix 2. Data Navigation QC

Line	Heading (Deg)	Straight Line Distance (m)	Acquisition Time (seconds)	Avg Straight Line Velocity (km/hr)	Points	Flight Distance (m)	Avg Flying Velocity	Avg Point Spacing (m)
1	329.16	75,498.66	0	0	4,415	75,686.58	0.00	17.15
9	329.69	100,004.50	0	0	5,805	100,080.80	0.00	17.25
10	149.78	112,327.30	0	0	6,944	112,457.10	0.00	16.20
11	329.70	122,729.40	0	0	6,995	122,812.80	0.00	17.56
12	149.63	122,815.90	0	0	7,339	122,902.40	0.00	16.75
13	329.86	121,897.30	0	0	6,895	121,946.20	0.00	17.69
14	149.82	60,438.99	0	0	3,703	60,499.18	0.00	16.35
15	149.79	123,071.70	0	0	6,600	123,131.70	0.00	18.66
16	329.78	117,728.40	0	0	5,855	117,860.40	0.00	20.14
17	149.94	120,748.50	0	0	7,404	120,900.10	0.00	16.33
18	329.92	120,343.90	0	0	6,754	120,409.30	0.00	17.83
19	149.98	123,077.40	0	0	7,595	123,229.90	0.00	16.23
20	329.94	119,714.60	0	0	6,810	119,773.00	0.00	17.59
21	150.10	119,831.10	0	0	7,238	119,954.10	0.00	16.58
22	329.92	119,311.10	0	0	6,648	119,357.20	0.00	17.96
23	149.98	118,818.50	0	0	7,195	118,951.30	0.00	16.54
24	330.00	118,149.60	0	0	6,754	118,226.00	0.00	17.51
25	330.35	131,766.30	0	0	7,507	131,996.40	0.00	17.59
25	330.80	5,702.39	0	0	320	5,705.57	0.00	17.94
26	150.23	117,864.80	0	0	7,243	118,008.20	0.00	16.30
27	330.15	114,380.90	0	0	6,744	114,472.20	0.00	16.98
28	150.23	85,305.61	0	0	5,239	85,416.38	0.00	16.31
28	270.00	0.00	0	0	1	0.00	0.00	0.00
28	153.58	16.50	0	0	2	0.00	0.00	0.00
28	150.63	35,033.38	0	0	2,154	35,124.43	0.00	16.32
29	330.14	117,591.40	0	0	6,941	117,688.00	0.00	16.96
30	150.11	120,401.60	0	0	7,794	120,565.40	0.00	15.47
31	330.16	116,950.30	0	0	6,746	117,109.50	0.00	17.36
32	150.28	115,945.20	0	0	7,439	116,089.20	0.00	15.61
33	330.10	110,631.40	0	0	6,400	110,682.70	0.00	17.30
34	149.95	105,439.30	0	0	6,943	105,540.00	0.00	15.21
35	330.29	98,923.97	0	0	5,655	99,080.95	0.00	17.53
36	150.05	84,853.02	0	0	5,401	84,966.15	0.00	15.74
37	330.05	88,494.06	0	0	5,115	88,566.92	0.00	17.32
38	150.15	84,779.48	0	0	5,705	84,860.61	0.00	14.88

Table 2a. Timor Sea ALF MkII Survey Line Navigation Summary.

Line	Heading (Deg)	Straight Line Distance (m)	Acquisition Time (seconds)	Avg Straight Line Velocity (km/hr)	Points	Flight Distance (m)	Avg Flying Velocity	Avg Point Spacing (m)
39	329.91	78,770.65	0	0	4,514	78,918.23	0.00	17.49
40	150.09	74,163.31	0	0	4,980	74,215.20	0.00	14.91
41	329.99	66,754.25	0	0	3,870	66,799.16	0.00	17.27
42	149.69	61,171.87	0	0	4,070	61,250.21	0.00	15.06
43	329.85	104,181.10	0	0	5,714	104,227.60	0.00	18.25
44	150.38	131,821.50	0	0	8,484	132,040.30	0.00	15.57
45	330.19	143,633.00	0	0	7,900	143,692.20	0.00	18.19
46	150.17	165,736.40	0	0	10,474	165,913.60	0.00	15.84
47	330.07	186,294.10	0	0	9,524	186,431.30	0.00	19.58
48	150.09	206,665.20	0	0	11,614	206,865.40	0.00	17.81
49	330.34	220,424.70	0	0	12,996	220,573.20	0.00	16.98
50	150.22	210,713.40	0	0	13,694	210,892.00	0.00	15.40
51	330.24	205,515.80	0	0	11,704	205,645.70	0.00	17.57
52	150.34	198,086.80	0	0	12,239	198,358.70	0.00	16.21
53	330.19	193,946.20	0	0	11,050	194,074.80	0.00	17.57
54	150.12	183,721.30	0	0	11,864	183,913.90	0.00	15.50
55	330.14	177,051.20	0	0	10,169	177,197.60	0.00	17.43
56	151.08	172,615.10	0	0	10,174	172,848.60	0.00	16.99
57	330.10	164,724.30	0	0	9,175	164,806.50	0.00	17.97
58	150.06	161,608.30	0	0	9,620	161,783.70	0.00	16.82
59	330.05	165,496.40	0	0	8,435	165,629.90	0.00	19.64
60	149.95	167,824.20	0	0	9,124	167,925.10	0.00	18.41
61	330.05	170,444.40	0	0	8,384	170,568.00	0.00	20.35
62	149.96	173,861.80	0	0	9,129	173,978.70	0.00	19.06
63	330.16	65,833.66	0	0	3,770	65,862.48	0.00	17.48
64	150.51	57,482.04	0	0	3,475	57,567.53	0.00	16.58
65	330.38	43,221.27	0	0	2,485	43,257.30	0.00	17.42
66	150.36	31,673.16	0	0	1,935	31,707.34	0.00	16.40
67	329.56	21,787.64	0	0	1,235	21,807.16	0.00	17.69
68	150.98	10,623.39	0	0	650	10,647.87	0.00	16.43
360	151.61	3,774.81	0	0	223	3,775.54	0.00	17.08
1	9.96	52,363.05	0	0	2,836	52,689.18	0.00	18.59
Total		**7,522,570.76**			**439,808**	**7,529,914.67**		

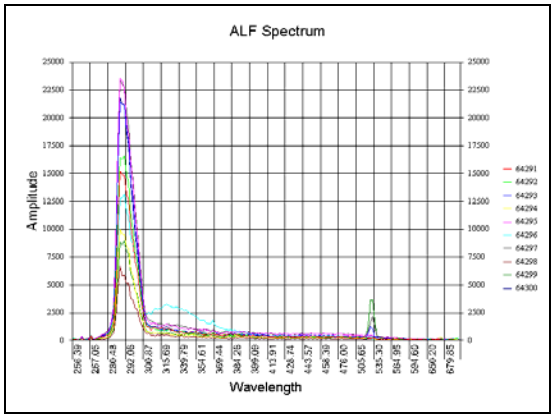
Table 2b. Timor Sea ALF MkII Survey Line Navigation Summary.

A total of 439,808 ALF spectra were recorded on 67 lines with an average point spacing of 14.9m to 19.6m. A total of 7,530km of lines were flown during the surve

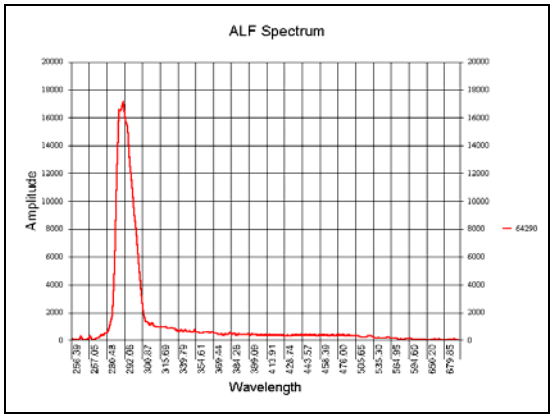
Appendix 3. Comparison of MkII and MkIII ALF Survey Data

Figure 16 shows a comparison of ALF MkIII survey data from the Skua region with the Timor ALF MkII data. Figure 16a shows a typical isolated MkIII fluor within ten adjacent spectra. Figure 16b shows a typical non-fluorescing spectrum. A medium intensity fluor is shown in Figure 16c. When the fluor is averaged with the surrounding non-fluor spectra (Figure 16d), the response is difficult to distinguish from the non-fluor spectra. The averaging process has tended to filter out the fluorescence response and enhance the more consistent water response.

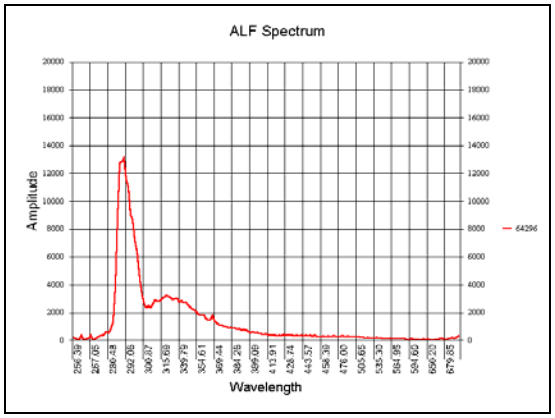
Figures 16e and 16f show a typical non-fluor and interpreted medium intensity fluor from the Timor MkII ALF survey. The refined interpretation method is required to distinguish the more subtle MkII fluors. One of the largest non-noisy fluors detected on the Timor Sea data (excluding the Jabiru region) is shown in Figure 8f.



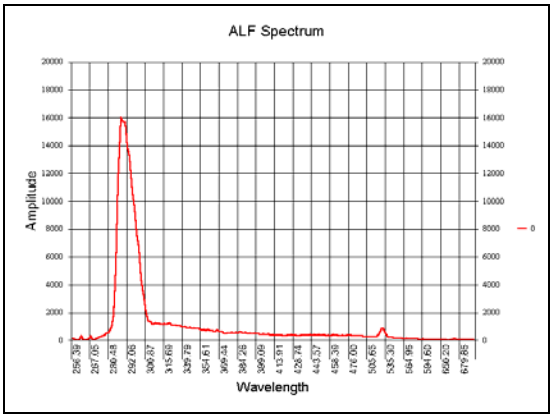
a) Skua ALF MkIII Ten Adjacent Spectra



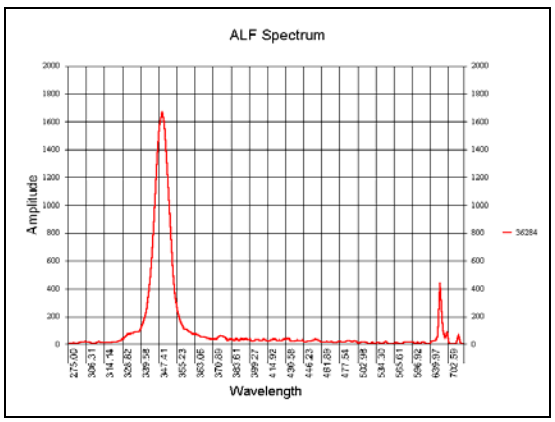
b) Skua Line 30130 No Fluor



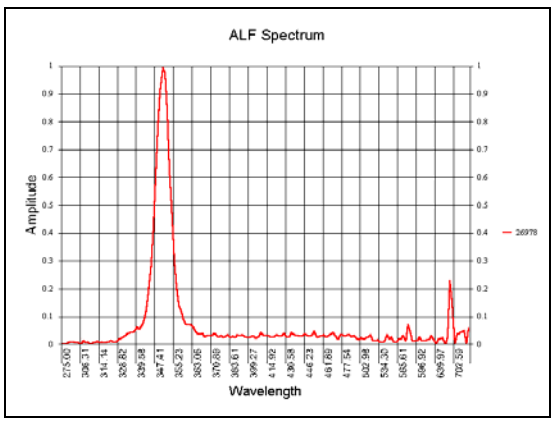
c) Skua Line 30130 Medium Fluor



d) Skua Line 30130 Ten Spectra Averaged



e) Timor MkII Line 15 No Fluor



f) Timor MkII Line 21 Medium Fluor.

Figure 16. Comparison of Skua MkIII and Timor Sea MkII ALF Data.

Appendix 4. CD Contents

The CD contains the following files:

Timor Sea MkII ALF Project.zip
: the *ALF Explorer™* project

Timor Sea MkII ALF Survey Interpretation Report.doc
: the interpretation report document file

Timor Sea MkII ALF Survey Picked Fluors.txt
: an ASCII data file of the fluors selected during the interpretation

Jabiru Fluors.txt
: An ASCII data file of the fluors selected over the Jabiru Field.

Timor Sea MkII ALF Survey Summary.xls
: Excel spreadsheet containing the survey acquisition and navigation QC summaries

Figures
: Directory containing figures used in the interpretation report