

FRANKLIN

National Facility
Oceanographic Research Vessel

CRUISE SUMMARY

R/V FRANKLIN

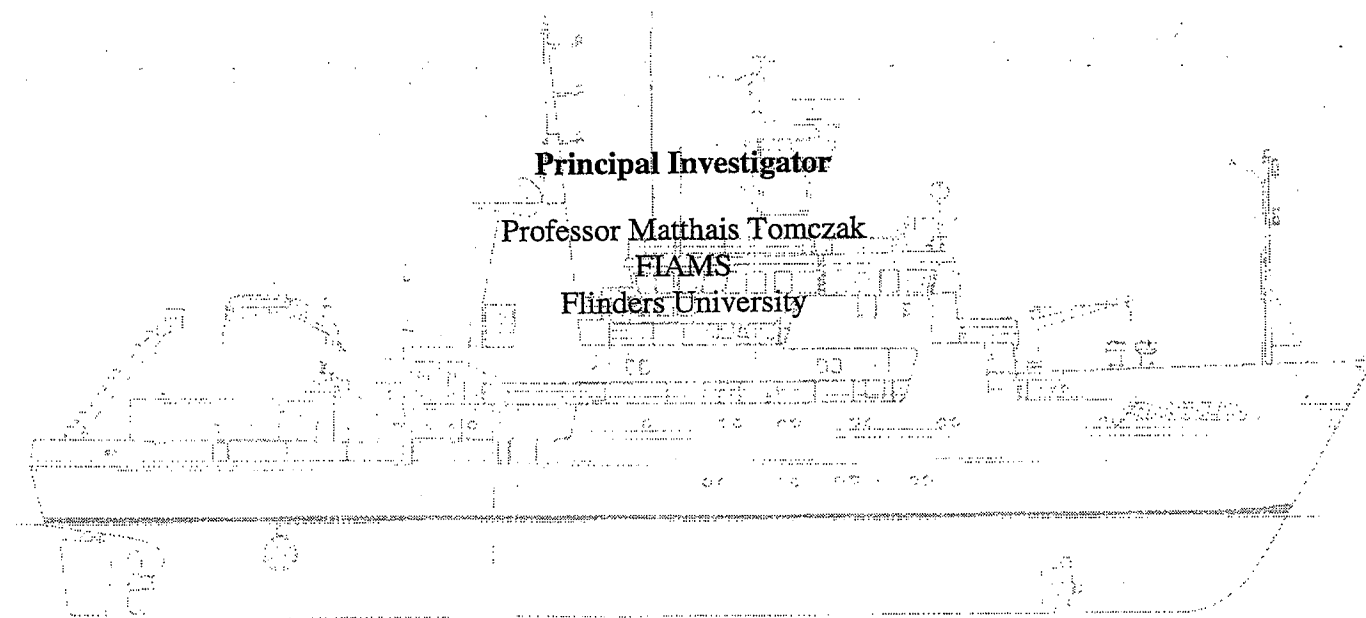
FR 10/98

**Continuity of the Subtropical Front and its Seasonal Variation South of
Australia.**

Departed Portland 1000 hrs, July 30, 1998
Arrived Hobart 1000 hrs, August 18, 1998

Principal Investigator

Professor Matthais Tomczak
FIAMS
Flinders University



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Cruise Summary
R.V. Franklin
FR10/98

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Itinerary

Depart Portland 1000 hrs, 30 Jul 1998
Arrive Hobart 1000 hrs, 18 Aug 1998

Principal Investigator

Prof. Matthias Tomczak
FIAMS
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Objectives

Research voyage FR10/98 was the second of two research cruises (see FR02/98) to study seasonal variability of the position and intensity of the Subtropical front south of Australia. Historical reports place the Subtropical Front south of Australia at latitudes south of 40°S and show it as a continuous feature. Observations during RV Franklin cruise FR10/94 located the Subtropical Front in the vicinity of 40°S near 120°E (between Albany and Esperance) but very close to the Australian shelf, near 35°S, at 132°E (the Head of the Bight). Observations from FR02/98 place the Front along 39°S between 120°E and Tasmania. Taken in combination with our historical understanding, this could suggest either large regional, seasonal or interannual variability of the Front, or the need for a complete reassessment of the situation in the Great Australian Bight.

The aims of the cruise were to:

- Verify or refute the permanent existence and regional continuity of the Subtropical Front south of Australia.
- Determine the seasonal variation in position and magnitude of the sea surface temperature gradient across the Subtropical Front south of Australia, and in the Tasman Sea.
- Estimate the velocity field and associated transport of the Subtropical Front.
- Determine the continuity of transport from the eastern Indian Ocean to the Tasman Sea.

Cruise Narrative

The ship left Portland on time at 10.00 EST on Thursday 30 July 1998 and set course to 118E, 40S.

Satellite imagery available from the week 17 - 24 July indicated warm water, of a temperature near or above 14C, on the South Australian shelf and over the continental slope and cold water with temperatures below 12C in the central Australian Basin. A filament of cold water was seen to intrude onto the shelf south west of Mount Gambier. To get a preliminary idea of the temperature structure associated with the cold and warm waters two CTD stations were performed in the area of the cold filament and to the west of it.

Given the adverse weather conditions, which could be encountered during winter, the cruise plan estimated 5.5 days for the westward journey to reach the start position for scientific work. A series of fast travelling fronts slowed down the ship's progress; at one point the ship had to change course by 30 degrees to continue steaming and eventually had to heave to for several hours. After 5.5 days R/V Franklin had reached 119 30E at 39S and had just crossed a second intense thermal front (having crossed a similar front only 10 hours earlier). Satellite imagery showed that the ship had reached the Subtropical Front, which was pushed southward by strong eddies from the Leeuwin Current and therefore showed increased horizontal gradients. It was decided to make this position the starting point for the investigation of the Subtropical Front, the aim of the research voyage.

The remainder of the voyage consisted of SeaSoar tows alternating with CTD stations to 1500 m depth at the beginning and end of each tow. The tows were arranged to cross the front in a zigzag pattern as shown in the cruise track (Figure 1). A total of 14 front SeaSoar tows ("legs") was obtained. Most legs started and ended with a CTD station to allow the determination of geostrophic transport along the front; only the CTD between legs 10 and 11 had to be abandoned due to inclement weather.

The weather improved greatly when R/V Franklin had reached the westernmost position and remained fair until the end of the voyage. A fast moving frontal system did not catch up with the ship until the entrance to the Derwent River was reached, and the last two days were extremely calm. By then a large data set of excellent quality had been collected, making the voyage a complete success.

Besides the reasonable winter weather conditions, the major credit for this success goes to the performance of the SeaSoar system. To prevent a repeat of the problems experienced during the summer voyage (FR02/98), when the SeaSoar sensors were frequently clogged up temporarily with marine biota, the sensors were fitted with deflector caps. These increase the sensor response time and reduce sensitivity to finestructure features but proved very effective in preventing material from clogging up sensors; at the same time the sensors are still sensitive enough to resolve the frontal features of interest. Disparities between the two SeaSoar sensor systems indicating clogging up of one sensor were observed on only very few occasions during this voyage. As a result, the FIAMS participants could return to Adelaide with a fully calibrated and quality controlled final SeaSoar data set. Figure 2 shows an example of the SeaSoar sections collected.

The ship's officers and crew went about their work with skill and care as usual and were always responsive to the scientists' needs and very helpful. They can take much credit for the success of the cruise.

Support from Kim Badcock from the CSIRO satellite oceanography group is gratefully acknowledged. Kim sent an update of the situation in the form of a weekly composite sea surface temperature image for the current week, which influenced the planning of the last third of the voyage.

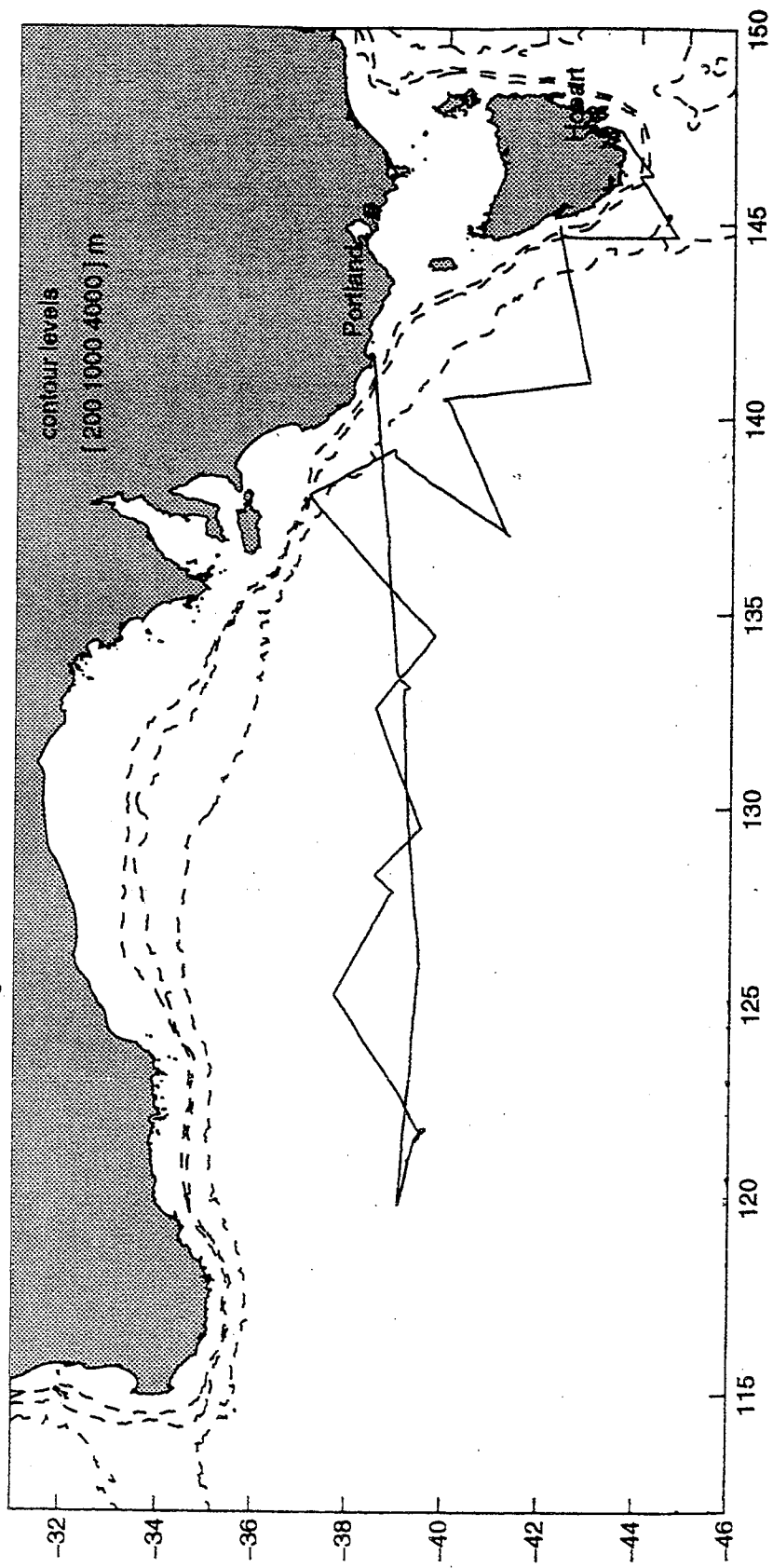
The structure of the Subtropical Front appeared more complex than anticipated. Two fronts were found at the surface, one at 10 - 12C located between 38S and 41S and another one at 12.5 - 15C. Satellite imagery showed that the latter front was clearly associated with warm water found at the shelf break but that this water was carried into the deep ocean in eddies and extrusions to large distances offshore. The location of this front could therefore vary significantly. It remains to be clarified which of the two fronts is to be seen as the surface expression of the Subtropical Front, or whether in fact both fronts form part of a larger Subtropical Frontal Zone.

The ship met the Hobart pilot at 10 a.m. on Tuesday 18 August 1998 and docked at the CSIRO berth half an hour later.

Personnel

Matthias Tomczak	FIAMS	Chief Scientist
Charles James	FIAMS	Watch Leader
Duncan Tippins	FIAMS	
Mark Hemer	FIAMS	
Lindsay Pender	CSIRO	Cruise Manager
Ian Helmond	CSIRO	SeaSoar
Eric Madsen	CSIRO	Electronics
Kevin Miller	CSIRO	SeaSoar
Mark Rayner	CSIRO	Hydrochemistry
Rohan Clarke	Monash University	
Neil Cheshire	Master	
Arthur Staron	First Mate	
Allan McCarthy	Second Mate	
Ernie Watkins	Chief Engineer	
Gordon Gore	First Engineer	
Andrew McLagan	Electrical Engineer	
Phil French	Greaser	
Jannik Hansen	Bosun	
Norm Marsh	AB	
Peter Mason	AB	
Wayne Browning	AB	
Ron Culliney	Chief Steward	
Gary Hall	Chief Cook	
Tom Condon	Second Cook	

Figure 1. FR1098 Cruise Track



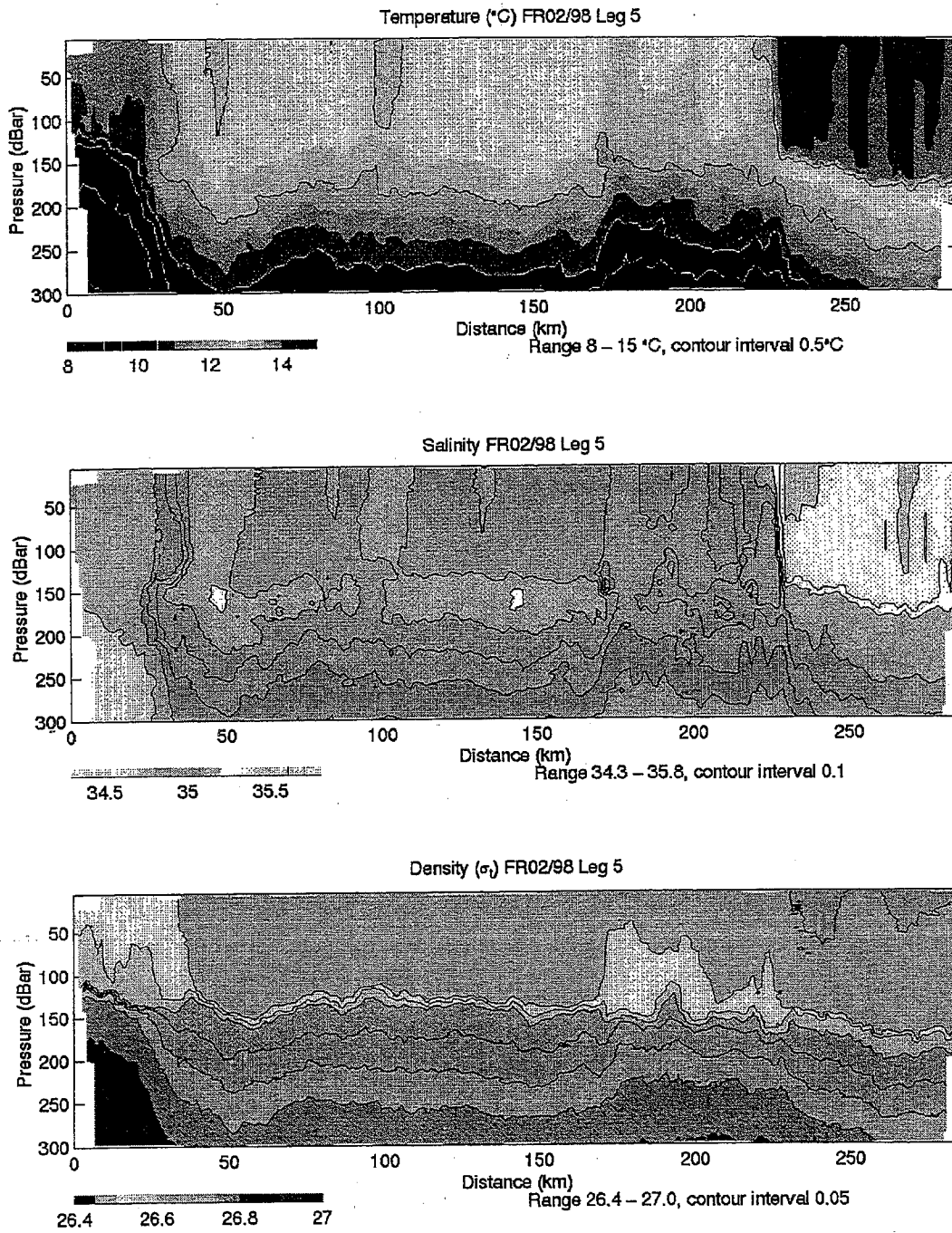


Figure 2. Example of a SeaSoar section.