

# 59.5 Degrees South

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Year 6



## Overview

59.5 degrees south is the GPS position where the author dropped an Argo float into the Southern Ocean. This article is a recount of her journey on the NIWA ship, *Kaharoa*.

The high-tech Argo floats gather data from oceans all around the world, helping scientists learn about the temperatures and movements of the seas. The natural, scientific, and technical concepts covered in the article are complex, but the text is well illustrated with photos, maps, and labelled diagrams, as well as footnotes and a glossary.

In learning about Argo floats, students will also learn about global

issues such as climate change and the ways that scientific data is helping us understand and prepare for rising sea levels and an increase in tropical storms. The article supports the theme of science as a way of “explaining the world” and demonstrates one way that technology can contribute to scientific knowledge.

Texts related by theme

“Plight of the Sea Turtle” SJ 3.2.08 | “Save the Whales!” SJ L3 Sept 2011 | “Jellyfish” SJ L3 Sept 2012

## Text characteristics from the year 6 reading standard

figurative and/or ambiguous language that the context helps students to understand

some ideas and information that are conveyed indirectly and require students to infer by drawing on several related pieces of information in the text

**ARGO ADAPTATIONS**

Our trip to Antarctica is in March, at the end of summer. At night, we notice a little sea ice forming around our ship, warning that winter is on its way. During the winter months, no sunshine reaches Antarctica and it's dark twenty-four hours a day. Without the sun, temperatures drop so low that the surface of the sea freezes over. The Argo floats that are in this area must stay well below the surface or they might be damaged by the ice.

The Argo floats we've released near Antarctica have special ice sensors. These check the water temperature each time the float ascends. If the temperature is close to freezing near the surface, the float returns to its parking depth. A week later, it tries again. Sometimes it can take several months before the ice has melted and the Argo float can finally surface to send its data.

**STILL AT SEA**

Ten days later, on our way home, Dan shows me a printout of the data from our sixth float. He's also printed a map that shows the Argo floats we've deployed. It's exciting to see—and just as exciting to imagine where our floats will get to next. The best thing is that I can keep visiting the website ([www.argo.ucsd.edu](http://www.argo.ucsd.edu)) to see for myself.

But for now, I want to concentrate on the amazing environment I'm in. Tomorrow morning, we're due to arrive at Campbell Island. We'll get to visit an albatross colony, and we'll have a couple of days walking around on land. What a nice change that will make from these endless ocean waves!

*Our Far South Argo float deployment sites*

**Glossary**

current: water that flows along the same path  
eddy: a circular current, flowing in a different direction from the main current  
GPS: Global Positioning System  
salinity: the amount of salt in water  
tropics: the area on either side of the Equator, where it is warm all year round

sentences that vary in length and in structure (for example, sentences that begin in different ways and different kinds of complex sentences with a number of subordinate clauses)

some information that is irrelevant to the identified purpose for reading (that is, some competing information), which students need to identify and reject as they integrate pieces of information in order to answer questions

illustrations, photographs, text boxes, diagrams, maps, charts, and graphs that clarify or extend the text and may require some interpretation

## Possible curriculum contexts

### SCIENCE (Nature of Science)

Level 3 – Understanding about science: Appreciate that science is a way of explaining the world and that science knowledge changes over time.

### ENGLISH (Reading)

Level 3 – Ideas: Show a developing understanding of ideas within, across, and beyond texts.

### ENGLISH (Writing)

Level 3 – Ideas: Select, form, and communicate ideas on a range of topics.

### Possible reading purposes


- To learn about the author's exciting trip to Antarctica
- To find out how scientists gather and use information about the oceans
- To understand more about how science can help us now and in the future.

See [Instructional focus – Reading](#) for illustrations of some of these reading purposes.

### Possible writing purposes

- To describe another way in which science can explain a natural phenomenon
- To interview and report on a scientist's understanding of how their work explains the world.

See [Instructional focus – Writing](#) for illustrations of some of these writing purposes.

 The New Zealand Curriculum

## Text and language challenges

### VOCABULARY:

- Possible unfamiliar or technical terms and phrases, including “cabin mate”, “onboard geologist”, “Argo float”, “monitor”, “fumble”, “swell”, “GPS”, “59.5 degrees south”, “devices”, “salinity”, “data”, “adrift”, “research vessels”, “programmed”, “sample”, “drift”, “eddies”, “network of currents”, “Antarctic Circumpolar Current (ACC)”, “tropics”, “built-in transmitter”, “satellite”, “database”, “international project”, “Oceanographers”, “Meteorologists”, “climate change”, “Adaptations”, “sea ice”, “ice-sensors”
- The acronyms: “GPS”, “ACC”
- The colloquial or idiomatic language: “box and all”, “Who knows”, “bob around”, “for good”
- The simile: “Like jellyfish”
- The metaphor: “‘parking’ depth”.

### Possible supporting strategies

Use copies of the illustrations or videos to preview some of the concepts and vocabulary and help students make connections with their prior knowledge.

Create a concept map of the key concepts and terminology associated with gathering data in the ocean. For examples of concept maps and other vocabulary strategies, refer to ESOL Online at <http://esolonline.tki.org.nz/ESOL-Online/Teacher-needs/Pedagogy/ESOL-teaching-strategies/Vocabulary>

Look at the maps and discuss what they show. Check that students understand the world's oceans are all connected and that currents move through them all.

Identify the topic-specific vocabulary that students will need. Offer them guidance on which words are most important and which are very low frequency and not such a priority. *The English Language Learning Progressions: Introduction*, pages 39–46, has useful information about learning vocabulary.

### SPECIFIC KNOWLEDGE REQUIRED:

- Knowledge of the world's oceans and how they are connected
- Knowledge of the concept of climate change, what evidence there is of it, and what might cause it
- Knowledge of the ways scientists gather data from the oceans.

### Possible supporting strategies

Combine support for specific knowledge of ocean research with support for the vocabulary. Ideally, create opportunities for students to encounter background knowledge about New Zealand's scientific work in the Southern Ocean. For example, show and discuss photos or video from NIWA's website and present or review vocabulary.

This is a complex topic, and ELLs may benefit from exploring the topic, or selected aspects of the topic, in their own language before reading the article.

### TEXT FEATURES AND STRUCTURE:

- A mixed text type that contains a recount, report, and explanation
- The title, which is a GPS position
- The use of photos, maps, charts, and diagrams to convey technical information
- The need to interpret and integrate complex information about ocean movements and the role of Argo floats
- Headings that signal subtopics
- A glossary
- A range of sentence types
- Mixed time frames and associated verb forms and time markers.

### Possible supporting strategies

Remind the students to use what they know of reports and recounts to identify key features as they read. If necessary, support students to use the headings, diagrams, and maps.

Students may require support to understand the function of the Argo floats (pages 12–13 and 15) and to integrate this with the information about ocean movements on page 14. Work through these parts of the text together, prompting students to make connections within the text and between the text and the graphic features.

The article contains dense information and a wide range of text features, sentence structures, time frames, and vocabulary. Students (especially ELLs, who will find the article challenging) will benefit from exploring the content before reading and from tackling the text in manageable chunks. After exploring the topic and the vocabulary, you could use a shared reading approach for pages 10–11. Then give small groups copies of the headings on poster paper and some of the pictures and/or maps and diagrams. Have the groups discuss them and make notes about what they think will be under each heading (or their questions). Display all of the notes and discuss their ideas together. Feed in key concepts and vocabulary during this discussion. After reading pages 12–13 (either as a guided or a shared reading), you could assign the next three sections each to a group. Provide a graphic organiser for them to record key information, then share information (either presenting to the other groups or in new groups with one person from each). Read pages 14–19 (shared or guided) and create a class version of the graphic organiser with the key information.

 Sounds and Words

# Instructional focus – Reading

**Science** (Nature of Science, level 3 – Understanding about science: Appreciate that science is a way of explaining the world and that science knowledge changes over time.)

**English** (Level 3 – Ideas: Show a developing understanding of ideas within, across, and beyond texts.)

## Text excerpts from “59.5 Degrees South”

### What Is an Argo Float?

Argo floats are special devices that measure the temperature and salinity of sea water. The data they collect is used by scientists around the world to learn more about our oceans. Today, around 3500 Argo floats are adrift from the Arctic Ocean to the Southern Ocean. Some floats are released by huge container ships; others by small research vessels.

## Students (what they might do)

*The students use the heading, information from their prior knowledge of floats and buoys, the previous section of text, and the photos to form the hypothesis that they are floats used for a scientific purpose. They use their knowledge of sea water, and their knowledge of text features to check the glossary, to infer that the “salinity” of sea water refers to its saltiness. Students ask questions and search for answers about the way the floats collect data, why there are so many, and what scientists can learn from the data.*

### Oceans on the Move

Sea water flows in a network of currents that circle the globe.

The Antarctic Circumpolar Current (ACC), in the Southern Ocean, is the world’s longest and strongest ocean current. It extends from the ocean surface to the seabed and can be as deep as 4 kilometres. Water in the AVV is some of the coldest on the planet. The water in other currents, such as the Gulf Stream, is much warmer. This is because water in the Gulf Stream has been heated in the tropics.

*The students integrate several pieces of information from this and other parts of the text (including the map) with their own experiences of sea currents to understand the movement of currents around the world. They use their knowledge of vocabulary and paragraph and sentence structure to identify the cause-and-effect relationship signalled by the word “because”. They use information in the text, and their own knowledge of Antarctica to infer the reason that the ACC is so cold. The students recall that Argo floats “can drift thousands of kilometres” and ask questions about the ways currents affect them.*

Scientists interested in climate change also use the Argo data to track changes in sea water temperature. Over time, this tells them which parts of the ocean are becoming warmer or cooler. The scientists can then make predictions about the effects of these changes, which include rising sea levels and an increase in tropical storms.

*The students integrate ideas and information and consider how it links with what they know about the debate on climate change. They make further connections with what they know of recent tropical storms and integrate this to understand that global warming is a serious concern. They infer that the Argo floats are an important tool for monitoring change and helping countries to prepare for climate changes.*

## METACOGNITION

- Show me a place where you had to reread to make sure you understood.
- What strategies were most useful for reading this text? Why do you think they were helpful?
- Did the article change your thinking about climate change? How?

## Teacher (possible deliberate acts of teaching)

**PROMPT** the students to slow down their reading and to make connections that will help them understand the text.

- Think about floats – what do you already know about them? How might Argo floats be similar to ones you’ve seen in the sea?
- Keep the information you’ve already learnt in mind, both from this article and from your studies. Think about things you already know about sea temperature.

**EXPLAIN** that asking questions in your head as you read is a useful reading strategy. The questions help you search for information. Direct the students to share their questions.

- What are you wondering at this point? Share your questions with a partner.
- As you find the answers, share those too.
- Are there any questions left unanswered? How could you find the answers?

**ASK QUESTIONS** to check that the students are integrating information.

- What pieces of information tell you about ocean currents?
- How have you used the diagram to add to this information?
- What do you know about currents from your personal experience?
- How does integrating information help you to understand about ocean currents?

If students need more support, ask them to work in pairs to share their connections and their questions.

**ASK QUESTIONS** to help the students clarify their understanding.

- What is meant by “a network of currents”? Which currents flow past New Zealand?
- What can you infer from the diagram about the temperature of our sea water?
- What does “This” in the last sentence refer to? Why is water in other currents much warmer than water in the ACC? (As you discuss the answers to these questions, circle the word “because” and draw arrows from it to the previous sentence and the rest of the sentence. Write effect above the previous sentence and cause above the clause following “because”). Establish that “because” introduces a cause or reason.
- What can you infer about the distribution of the Argo floats around the world? Where might one dropped at 59.5 degrees south drift to?

**MODEL** integrating information.

- As I read this section, I remembered what I’d heard about climate change. I also remembered the terrible tropical storms we’ve had in recent years. This article has helped me to understand the kind of work scientists are doing to find out about changes in the oceans and climate. When I thought about all this, I realised how important it is that scientists are studying the oceans like this. This work can help countries prepare for storms and rising sea levels.

**GIVE FEEDBACK**

- Working with a partner helped you formulate questions and search for information. That’s a useful way to work on a complex text like this one.
- I noticed you moved back and forth between the text and the diagram to help integrate what you were reading.

Reading standard: by the end of year 6

The Literacy Learning Progressions

Assessment Resource Banks

# Instructional focus – Writing

**Science** (Nature of Science, level 3 – Understanding about science: Appreciate that science is a way of explaining the world and that science knowledge changes over time.)

**English** (Level 3 – Ideas: Select, form, and communicate ideas on a range of topics.)

## Text excerpts from “59.5 Degrees South”

### Six Down

Who’s that banging on my door? At five-thirty in the morning! “Time to get up – we’ve got a job to do,” says a quiet voice. Now I remember: my cabin mate and I said we’d help Dan, the onboard geologist, drop another Argo float into the sea.

### What is an Argo float?

Argo floats are ...

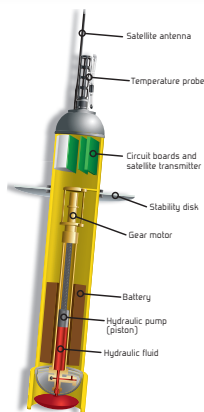
### Argo Adaptations

Our trip to Antarctica is in March, at the end of summer. At night, we notice a little sea ice forming around our ship, warning that winter is on its way.

### Still at Sea

Ten days later, on our way home, Dan shows me a printout of the data from our sixth float.

Argo floats don’t just bob around at the ocean’s surface. Instead, they are programmed to travel up and down in a cycle. This allows them to sample water at different depths. Like jellyfish, the floats also drift on the strong currents and eddies that constantly move sea water around Earth. During its lifetime, an Argo float can drift thousands of kilometres.



## Examples of text characteristics

### ENGAGING THE READER

*A personal voice can engage the reader’s interest in a factual topic. An engaged reader will be in a better frame of mind to understand the context and the technical content of an article. Adding a personal voice, typically in the introduction and the conclusion, to a technical report can give an article a “human face”.*

### EXPLAINING

*Explanations tell how or why something happens or how a process works.*

### USING GRAPHIC FEATURES

*Authors can use a variety of features to help readers follow or understand complex technical or scientific ideas. These include:*

- clear photos
- labelled diagrams
- maps with a key
- explanations
- a fact box.

## Teacher (possible deliberate acts of teaching)

**DISCUSS** how the students will communicate their ideas. You may like to show them further examples, including clips from TV or YouTube documentaries.

- How do writers and programme makers engage their readers or viewers in a serious or technical topic?
- Think about the way science documentaries are presented on TV: they often use a well-known or interesting person to introduce and narrate them.
- How does a “human face” increase the readers’ or viewers’ understanding?
- In “59.5 Degrees South”, the writer starts and ends with her personal experience. Why do you think she does that?
- How can you use some of these ideas in your writing to engage your readers?

**DIRECT** the students to review their writing.

- If you’re explaining something in your writing, look over your work and think about the language features that might help the readers follow your explanation.
- Read your explanation aloud to a partner: do they understand it easily? If there are parts that confuse them, how can you revise them?

Depending on the needs of your students, you could focus on useful features of reports and explanations, such as giving definitions, expressing cause-and-effect relationships, or expressing sequence. Focus on one feature at a time. For example, the definition given on page 12 provides a good model for constructing a writing frame for definitions. Display an enlarged version of the sentence with plenty of space between the lines. With the students, identify the different sections of the definition and label them. (Explain that not all definitions will follow this structure but that it is a common and useful one.) Construct a writing frame that gives the different sections, like the example below. Co-construct other examples of definitions and write them into the frame. Have the students work in pairs to construct their own examples to read out to the other pairs, missing out the name of the item so their classmates can guess. Continue to support students to include definitions in their factual writing.

Item	is/are	category	that or with	what it has or what it does
Argo floats	are	special devices	that	measure the temperature and salinity of sea water.
Axes	are	tools	that	are used to chop wood.

**ASK** the students how they will support their readers to understand technical information.

- Which ideas or details in your writing are the most difficult to explain?
- If you find them hard, your readers may also find them hard! What can you do to support your readers?
- What graphic features will help your readers to understand your ideas?
- How will you create the graphics? What are the most important things to show?

### GIVE FEEDBACK

- You’ve explained this process well. The comparison with ... makes it a lot easier to understand.

### METACOGNITION

- How has thinking about engaging your audience changed your writing?
- Show me how you planned your writing. Which aspect of planning was most useful when it came to writing?
- Which revision strategies helped you most?

Writing standard: by the end of year 6

The Literacy Learning Progressions