

# Pacific Eclipse

by Fred Bruenjes



A Journey Through the Galapagos Islands  
to see the 2005 Annular-Total Solar Eclipse

# Trip Map



Source map: NASA World Wind / Blue Marble Next Generation April 2004

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### Key to Map

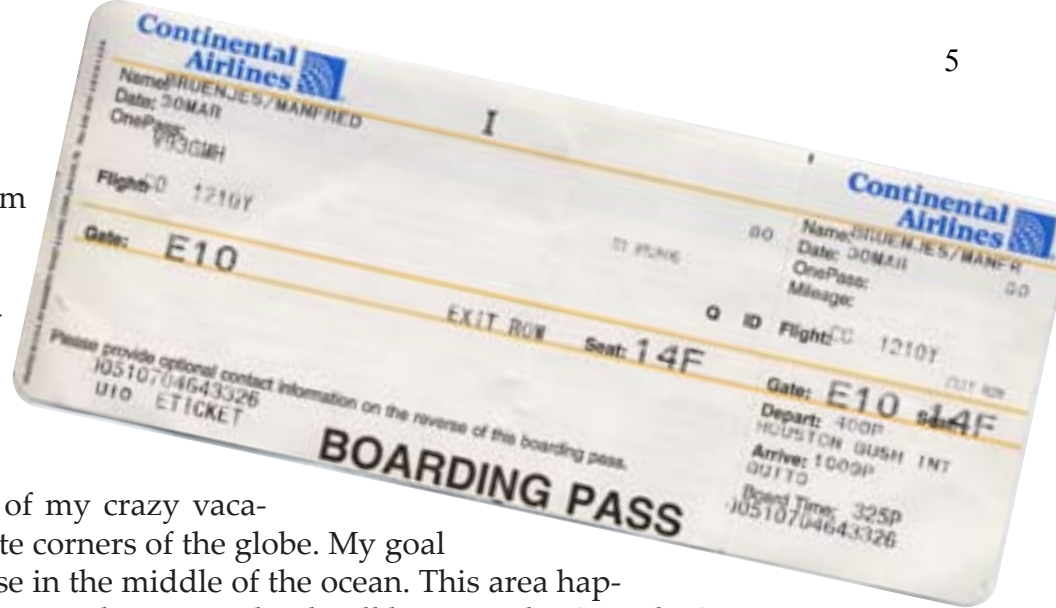
- |   |  |
|---|--|
| 1 - Day 2, AeroGal flight to islands            | 10 - Day 5, Sailing to eclipse site            |
| 2 - Day 2, Isla Baltra, airport                 | 11 - Day 14, Sailing back to islands           |
| 3 - Day 2, Isla Bartolome                       | 12 - Day 14, Roca Redonda                      |
| 4 - Day 3, Puerto Ayora                         | 13 - Day 14, Loop to observe animals           |
| 5 - Day 3, El Chato Tortoise Reserve, lava tube | 14 - Day 14, Loop to perform crew photo        |
| 6 - Day 4, Punta Espinosa                       | 15 - Day 14, Caleta Bucanero (Buccaneer's Bay) |
| 7 - Day 4, Tagus Cove / Darwin Bay              | 16 - Day 15, James Bay                         |
| 8 - Day 5, Urbina Bay                           | 17 - Day 15, Isla Rabida                       |
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This map was created from an actual GPS recording of the entire trip by my Garmin 60CS GPS. The track was plotted in NASA's World Wind software, using a false color LandSat satellite photo. This view has north up and is approximately 190km (120 miles) wide. The white puffs are clouds.



## Introduction

Two and a half weeks off from work... check  
 Plane tickets... check  
 Two week supply of seasickness medicine... check  
 Satellite phone... check  
 Quest for adventure... check



... and so begins another one of my crazy vacations to fascinating and desolate corners of the globe. My goal is to observe a total solar eclipse in the middle of the ocean. This area happens to be ground zero for El Niño. The nearest land will be 900 miles (1500 km) away, and even that is just an uninhabited French coral atoll off the Mexican coast, named Clipperton Island. The journey is most of the fun, so I'll be going through Ecuador and touring the Galapagos Islands before heading out to sea for the eclipse. I won't be doing this alone, the trip was arranged by Astronomical Tours and a hundred or so friends will be along.

What is a total solar eclipse? Well, through an amazing coincidence in geometry, every few years the Moon blocks out the Sun creating a solar eclipse. The Sun is 400 times the size of the Moon, and 400 times as distant, so they appear to be the same size when viewed from Earth. When the orbit of the Moon takes it between the Sun and the Earth, the shadow of the Moon is cast upon the Earth. If the Moon is close enough to the Earth, someone located near the middle of that shadow will see the Moon exactly block out the Sun in a spectacular show. This is a "Total Solar Eclipse", arguably the most spectacular show in astronomy. This particular eclipse is a special version, called an Annular-Total or Hybrid solar eclipse, because the Moon is just barely close enough to create a total eclipse in the Pacific. Because of the curvature of the Earth, people near the beginning of the eclipse track (off New Zealand) or the end (Panama) are too far away to get a total and they'll see an annular eclipse.

## Day 1: Wednesday March 30, 2005. San Diego, California, to Quito, Ecuador.

I can finally relax. For weeks I have been preparing and testing equipment for this trip, and working feverishly to get ahead at my electrical engineering job. I crossed off the last items on the 'to do' list just hours before embarking on this adventure.

I rose early in the morning and while driving to the airport was confronted with a surprising amount of traffic. What is everybody doing up at this time of the morning?! We San Diegans used to crow that our city had all the benefits of Los Angeles, without the traffic. Well, not any more!

At the airport I got some nasty treatment from the check-in agent because my checked bag was 72 pounds – two pounds over the limit. She let me off with a warning. Security was quick, with no

*San Diego airport*



invasive searches, which was a rare treat for someone who carries as much equipment as I do.



*San Diego*

I had to change planes in Houston, Texas. Quite a few members of our tour group were on the flight down to Quito, including several friends from previous eclipse trips. It was great to see them again, and to meet some new folks.

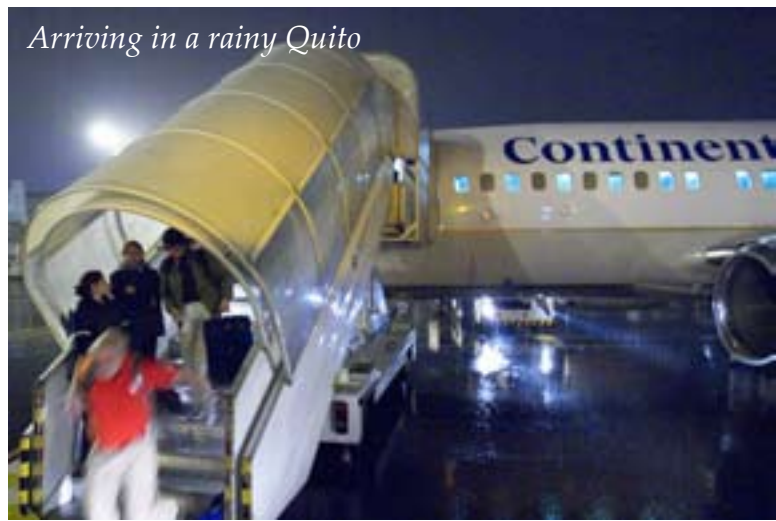


*Sunset over the Yucatan*



Descending into Quito was interesting because of the high altitude of the city (2850 m, 9,350 ft). Passenger aircraft are pressurized to simulate an altitude of around 8,000 feet, and when landing the air pressure increases to match that of the destination city. Quito is above the pressurization altitude of the aircraft, so during landing the air pressure went down, which was a strange feeling for an experienced air traveler like me.

It was raining and there was no jetway, so we dashed through the rain into busses, which took us the 200 feet to the terminal. After getting our bags and clearing customs, we were dumped into pandemonium with hundreds of locals trying to meet up with their clients or family. We located



*Arriving in a rainy Quito*

the shuttle bus from our hotel, and got swindled by some local boys posing as the hotel's porters – they loaded our bags when the hotel staff should have been doing it. Hotel check in was slow, and I finally got to my room (shared with fellow eclipse chaser Carter Roberts) about midnight.



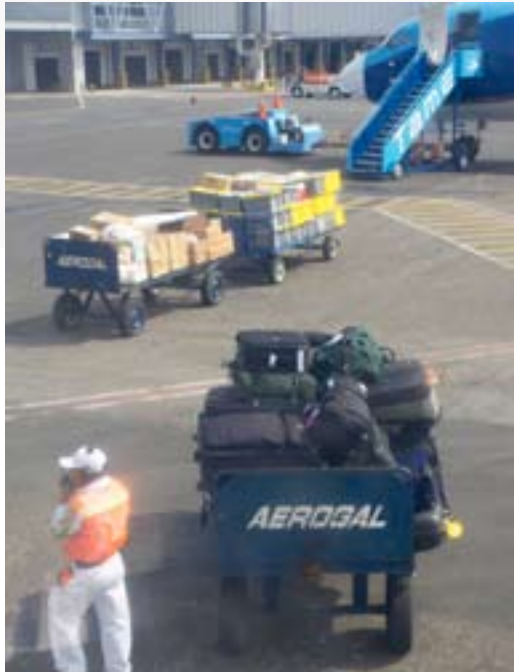


## Day 2: Thursday March 31, 2005. Quito, Ecuador to the Galapagos Legend and Isla Bartolomé.

The day started a few minutes before 5 AM (2 AM California time) at the hotel in Quito. Luckily, all of the passengers and most of the luggage made it this far. Some of Jay Pasachoff's luggage was mistakenly sent to the Caribbean, and tour leaders Vic & Jen Winter missed their flight from the USA (but made it onto a later one). Jay's luggage will supposedly be ferried out to the ship when it arrives.

The morning was organized chaos as the 90 or so tour members had to check out of the hotel and be bussed to the Quito Airport. No tags were placed on our checked luggage, so I'm baffled as to how they know which bag is flying where. We gave up trying to find our assigned seats on the old AeroGal 727 jet, and settled into whatever seats we liked.

The flight stopped in Guayaquil, Ecuador to refuel and pick up more passengers. Minor panic ensued when the baggage handlers began prematurely unloading our bags from the plane. It turned out they were just rebalancing the aircraft. When rolling down the runway for takeoff I noticed workers hacking weeds with machetes right at the side of the active runway. That must be a hellish job.







*Our first sight of our ship*



After arriving in the Galapagos Islands and paying the park entrance fees, we had to take small zodiacs out to our ship, the Galapagos Legend. The Galapagos Legend is a German-built ship, owned by Ecuadorians. All but one of the staff are Ecuadorian, with a Belgian hotel manager. The Captain is César Arcos, a veteran captain who had spent some time studying in my home town of San Diego after he graduated in Ecuador.



*The M/V Galapagos Legend*







Boarding was tricky



Loading supplies



The Galapagos Legend, formerly known as the Baltic Star, the Stena Finlandica, and originally the M/S Helgoland, was built in Germany in 1963. In the Vietnam War she served as a hospital ship.

I'm sharing a cabin with Olivier 'Klipsi' Staiger. Klipsi and I got to know each other back at the 2002 total solar eclipse in Australia. After exploring the ship a little, a life vest safety drill was held, and everyone met in the ship's lounge for a presentation on what to expect.





## MV Galapagos Legend

**PLACE OF CONSTRUCTION:** Germany  
**GROSS TONNAGE:** 2,890 T.  
**OVER-ALL LENGTH:** 91.50 meters  
**BEAM:** 14.30 meters  
**ENGINES (DIESEL):** 2 X 3,000 HP; 2 X 2,206 HP  
**GENERATORS:** 2 X 240 KW (type ASM 528); 1 X 180 KW  
**SCOW THRUSTERS:** 2 X 135 KW  
**STABILIZERS:** Marine Hydraulic System (Deery Brown)  
**CRUISE SPEED:** 15 Knots (1 Knot = 1 Nautical Mile per hour = 1.852 meters)  
**MAX SPEED:** 20 Nautical Miles  
**ELECTRICITY:** 110 and 220 volts ac on board

**FRESH WATER PRODUCTION:**  
 40 Metric Tons per day. You will find bottled water in your cabin (1 bottle per person); please recycle your bottles by refilling them at breakfast in the restaurant and during the day at either bar. This is for ecological purposes. Thank You.

**SAFETY BOX:**  
 You will find it in your closet. Instructions: While open, the number pad will appear sideways, press a 4 digit code, a "beep" will sound. Repeat your 4 digit code and turn the number pad counter clockwise. To open, enter your 4 digit code and turn the number pad clockwise.

**TOILETS:**  
 Please do not throw toilet paper in the toilet. IT WILL OBSTRUCT THE PPE. Use the garbage can. Our stewards will clean your cabins 2 times per day, changing towels and cleaning out the garbage cans.

**SAFETY:**

- 1 The crew will show you the way to your cabin and perform a safety drill
- 2 Please check exactly where the life vests are in your cabin.
- 3 Memorize the way in case an emergency should arise.
- 4 Ask your guide(s) or officers any questions you may have.
- 5 Life vests are provided to passengers to be used while riding the dinghy's to/from the island and boat. It is an obligation to use them for your safety. Also, be careful when walking on the deck while the boat is navigating, especially when the sea is turbulent.

**ALWAYS:**  
 Hold the guide or crewmember's hands while embarking or disembarking, as the boat ladder, decks or rocks on dry landings may be wet and very slippery.

**SNORKELING:**  
 On board we have masks, snorkels, fins and wet suits for rent.



Muster drill, courtesy John McKune



To lessen the impact of the 81 passengers and 65 crew on the islands, we are broken up into six landing parties. Split by cabin number into groups named Albatross, Boobies, Cormorants, Dolphins, Frigates, and Gaviotas (Gulls), each group is led by a naturalist / guide. I am in the Albatross group, led by Edison.



Our guide, Edison

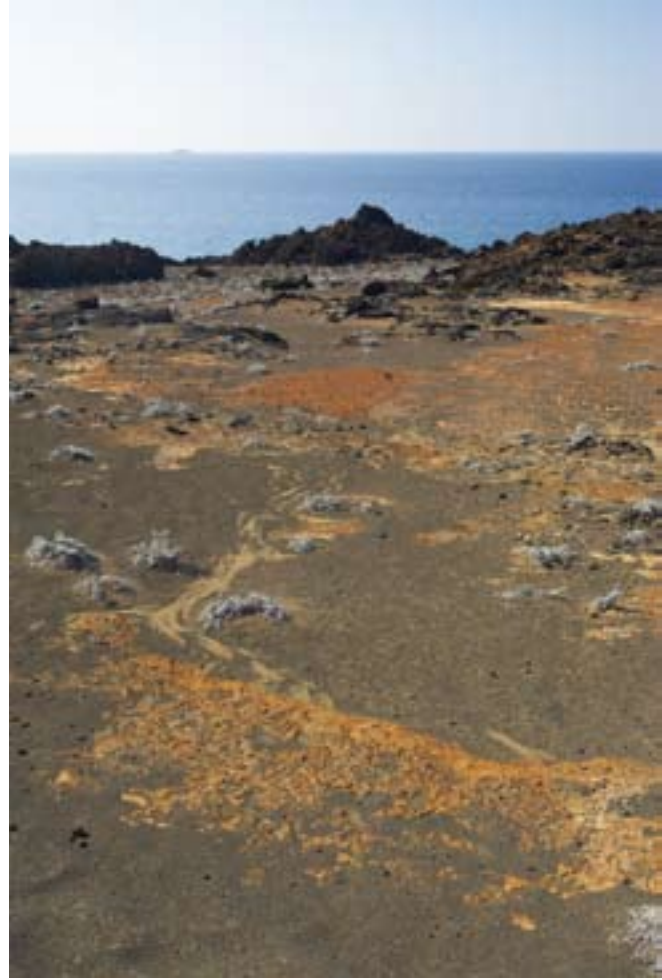






The long day wasn't over. The ship sailed to Bartolome Island, where in the afternoon we went hiking and some folks went snorkeling. We saw amazing volcanic craters and a surprising assortment of wildlife. Swaths of volcanic moonscape are broken only by small tufts of gray plants and an occasional lizard. Crusted volcanic cones of wide-ranging sizes abut small lava tubes. The island is mostly brown, but with a stark grove of green bushes that seems completely out of place. I instantly recognized the view from the peak of the island, as shots from there were used in the movie *Master and Commander*.











*One of the last photos taken by  
my water-damaged camera.*







*Blue Footed Booby*







It's great to be among fellow amateur astronomers, both longtime and newly made friends. We are getting to know each other and having a great time swapping stories of past trips.

Unfortunately, I learned that Canon's claims of the 1D Mark II digital camera being water resistant are overstated. While on the beach a wave kissed a small corner of my camera and completely killed the camera and attached wide angle 17-40mm F4L lens. Insurance covered the \$812.16 cost of repairing the camera and lens, but the loss of potential photos was a big blow, especially on just the first real day of the trip! This left me without any way to get high quality wide angle photos. Thankfully, I had my old Canon D60 DSLR along, as well as a G1 digital camera and video camera, so I was able to get shots of what I needed.

After dark quite a few of us went stargazing. The Captain obligingly turned off all of the lights on the upper deck of the ship, so we had a prime dark sky observing session.





## Day 3: Friday April 1, 2005. Isla Santa Cruz.

Today was Turtle Day for us: in the morning we visited El Chato Tortoise Reserve, in the afternoon Darwin Station. We saw tortoises large and small, old and unborn. It was humbling to see a "small" 300kg (650 lb) tortoise. We saw them in all ages, some over a hundred years old with shells that have been worn to a smooth surface. We learned that they must exhale in order to retreat into their shells, a position that they cannot hold for more than a few minutes lest they suffocate.



*Fred Espenak photographs a "small" tortoise*







*Inside an old tortoise shell*

Near the El Chato reserve, we walked down into a magnificent lava tube, formed ages ago when a river of lava coursed through the area. Dark and damp, I occasionally slip and bump into the walls, muddying myself and my cameras. What a change from the inferno it must have originally been.







*Lava tube*



*Puerto Ayora*







*Looking for Lonesome George*



*Once housed at the San Diego Zoo, this tortoise was returned to the Galapagos for a breeding program.*

After some shopping in Puerto Ayora, we walked to the nearby Darwin Station which serves as both zoo and conservation center. We see a sampling of life from all around the islands, and tried to see Lonesome George, possibly the last surviving member of a species from Isla Pinta. Adept at hiding, I spot him impersonating a rock.







A meeting was held

among the group leaders where we made some decisions about the eclipse chase. We found out that the captain of the ship had very little weather information. There isn't any severe weather on the equator here, so he has no need for fancy equipment. As I was the only person with a working satellite internet connection, I was asked to download weather satellite photos and cloud forecasts to help us find good weather. Klipsi's stormchasing knowledge will be used to help interpret the forecasts. We'll try to arrive at the view site about 18 hours early, after sailing continuously for three days 19 hours. We've decided to keep EST (five hours behind UTC), and to NOT observe the daylight savings time switch. How often does one get the opportunity to decide what the clock should say?! However, this will significantly change the sunrise and sunset times as we go west.



In the evening we made a rolling 250 km (155 mile) journey from Isla Santa Cruz towards Isla Fernandina. Abrupt lurches of the ship resulted in a cry to "Save the Gin!"



*VIPs on the trip (left to right): Jen Winter, tour leader. Wendee and David Levy, Fred Espenak and Pat Totten, Jay and Naomi Pasachoff, David Eicher, and Voyto Rusin.*



## Day 4: Saturday April 2, 2005. Isla Fernandina and Isla Isabela.



*Panga heading out to Punta Espinosa, courtesy John McKune*



*Small crabs*

Today we visited Espinoza Point on Fernandina Island, and Tagus Cove on Isabela Island. Fernandina was spectacular, with complete sensory overload we couldn't decide which way to point our cameras! Every way we turned there were marine iguanas, sea lions, flightless cormorants, eagle rays, crabs, hawks, blue footed boobies, and many more species were teeming above 120-150 year old lava. In the distance loomed the massive volcanoes of Isabela Island. I could have spent several days here, the photographic opportunities were endless on a prime day like this.

Fernandina's volcano last erupted in 1995. We secretly hoped for a new eruption, to complete our Galapagos experience with a flowing lava sighting. We almost got our wish: the volcano reawakened on May 13th 2005, just six weeks after our visit.



*Sunrise*



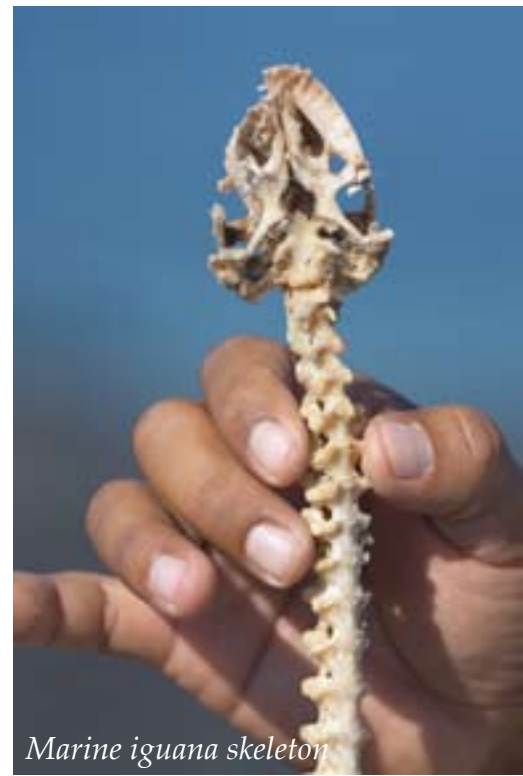
*Marine iguana*







*Galapagos Hawk*



*Marine iguana skeleton*







*Marine iguanas*







*Flightless cormorant*

A particularly fascinating attraction were the flightless cormorants, with their seaweed nests. We watched the males bring seaweed while the females tended to their egg.



I got sunburned despite two layers of SPF 45 sunscreen. I have a newfound respect for the sea lions, who were absolutely professional in their laziness. At midday I decided to take a lesson from the masters and managed to get a couple hours of sleep. I missed out on a snorkeling opportunity, but with the sting of losing a camera fresh in my mind I had no desire for any new adventures in water.

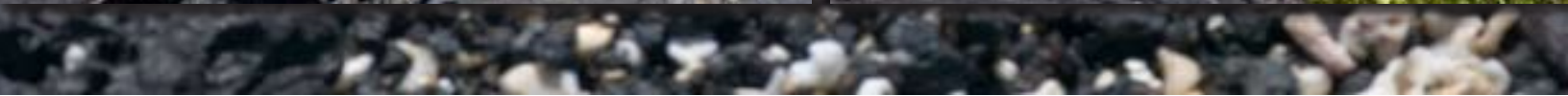




*Eagle rays*



*Ouch!*







In the afternoon we sailed to Isabela Island, the largest island. It's a collection of large volcanoes, and we hiked to Darwin Bay (also known as Tagus Cove), a crater with ultr saline water. The cliffs are lined with graffiti from visitors past, the oldest I could see was from about 1836 which is just one year after Charles Darwin's famous visit. It was extremely hot, so our group made slow progress, prompting our guide Edison to cut the trip short. Along the way we did see several of the types of finches Darwin studied, as well as flycatchers and a Galapagos hawk.





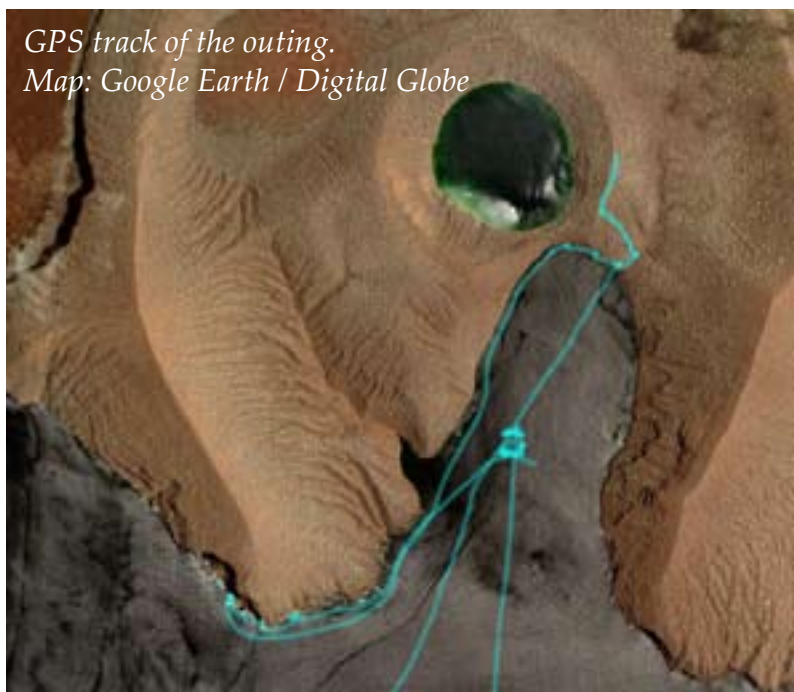
An evening check of the weather forecasts for eclipse time show a band of clouds smack on top of our targeted location, so Klipsi and I discussed moving the ship's aim point to a degree or two north latitude but eventually tabled the idea because forecasts are very unreliable this far in advance.



*Blue footed boobies*







GPS track of the outing.  
Map: Google Earth / Digital Globe



An artistic dinner







*Tortoise tracks lead to nesting ground*



## Day 5: Sunday April 3, 2005. Isla Isabela.

In the morning we hiked near Urbina Bay on Isabela Island in search of land iguanas. Despite starting out at 8 AM it was hot and humid. There were dead mangrove trees everywhere, victims of volcanic uplift that took them out of the water.

In contrast to marine iguanas, the land iguanas are more solitary, and are orange or brown instead of green. We also looked for tortoises but did not find any. Another large ship arrived (the M/V Santa Cruz) and we actually had a traffic jam of tourists on the narrow paths. Finding the iguanas was not a problem, we just looked for the nearest gaggle of people! In the end I saw five different land iguanas, a mockingbird, and the usual assortment of marine iguanas and crabs.



*Land iguana*









In the afternoon we visited Moreno Point, also on Isabela Island. This area is covered in 500 year old sharp fragile lava, with half-acre lagoons of water and fields of grass inexplicably dotted though the landscape. We saw four flamingoes, a variety of other birds, a white tipped shark, and finally some Galapagos penguins. Near the end of the hike, in a vast field of lava, I saw a spectacular panorama of five massive

*Cactus*



volcanoes spaced all around me: Fernandina's Volcan La Cumbre, Isabela's Volcan Darwin, Alcedo, Sierra Negra, and Cerro Azul. It was breathtaking, I had to stop and let the view soak in for a few minutes. My nose began to bother me, and I suspect it is an allergy to something on the island here.







*Flamingoes*



*Small yellow flowers*



*White tipped shark*





Weather forecasts for eclipse day were looking good, with maybe a few puffy clouds (just enough to make for good pictures). We were targeting for an intercept at 110 degrees west longitude.

At precisely 10:12 PM we felt the ship start up and head west, departing the Galapagos for the eclipse site. Placid conditions quickly gave way to strong rolling waves. Dishes flew off tables, and we heard many bumps in the night.



### *Penguin*





## Day 6: Monday April 4, 2005. Sailing west to the eclipse site.

Now that we're on the open ocean, the waves are much larger. The ship has been rolling +/- 15 degrees every eight seconds since we set out. For people on the upper decks that means having to brace themselves so they don't get thrown out of bed. As I wrote this on Monday evening, my deck chair went flying about three feet towards the swimming pool, with me, laptop, and satellite phone



*Morning wakeup call!*

along with it. Four seconds later I went flying back towards the edge of the ship! The ship is filled with stories of broken televisions and bruised limbs.



*A typical breakfast*

Today was a bit of a rest day after the hectic shore visits. Breakfast at 9. We staked out our observing positions for the eclipse and cleared them with Jen Winter. I'll be in a corner on the upper deck overlooking the pool deck, so that my special all-sky camera has a good view.



I saw a school of small flying fish. At first I thought I was imagining it, the sight of hundreds of fish jumping out of the water and flying dozens of yards in perfect synchrony seemed unbelievable. I didn't mention my sighting to anyone else on the ship for fear of being labeled a lunatic.

My "allergy" has developed into a full blown cold. There are several bugs going around the ship, and spending this much time with so many people in a confined space leaves no chance for escaping the sickness.



*Rocking and rolling!*







In the evening we saw the zodiacal light as clear as day. The only light pollution out here is what we bring with us.

The weather forecast for eclipse day looks better than it did yesterday - very good instead of just good.

## Day 7: Tuesday April 5, 2005. Sailing west to the eclipse site.

Today we continued our course to the west to intercept the eclipse path. There were more lectures, more stargazing, and a whole lot of relaxation. My cold kept me in bed for the entire day, save for mealtimes and a quick check of the weather forecasts. The rolling motions from the waves continue, and we have to hold our food and cups in front of us at meals. Even walking is a challenge, with passengers resembling drunks as we stagger to and fro across the ship.



*Your author, Fred Bruenjes*

We are settling into a rhythm, establishing habits and finding ways to pass the time. I find the rolling of the ship very soothing despite its severity, and sleep better and for more hours with each passing day.



## Day 8: Wednesday April 6, 2005. Sailing west to the eclipse site.

Today was yet another day of relentless sailing in our quest to meet the Moon's shadow. We have less than 24 hours until we arrive at our location of 109 degrees West, 0 degrees 56.18' S. We were originally targeting 110 West longitude, but that appears to have inferior weather prospects and would cost us precious fuel. We are pushing the ship to its absolute maximum range, and Captain Arcos is very relieved at the prospect of a shorter trip than anticipated.





We were given a very nice tour of the bridge of the ship. The equipment is basic but entirely sufficient for the normal uses of the ship. This ship was designed in another era, and the stabilizers just aren't good enough to overcome the strong swells. We have discovered that turning to sail with the waves considerably lessens the rolling, so if the swells are too strong at mealtimes the ship is turned to minimize the motion. When mealtime is over the ship returns to the proper course. The ship is cruising at around 14 miles per hour.



*Captain points out the eclipse path*

We continue to see schools of dozens of flying fish. They are about a foot long and can fly up to 100-200 feet. They pop up aside and ahead of the ship and fly away from it in synchronized swarms. They're not simply jumping, I have seen them navigate around waves to maximize their range. Two whales were spotted, both very distant.



*White tip flying fish*







Two nights ago was the last time we saw another ship. Our captain told me that it was a cargo ship hauling fruit from Chile to Los Angeles, he had a nice chat with them on the radio. Nothing else is nearby, we are alone out here. I don't even recall seeing any aircraft.

Light pollution is nonexistent and the zodiacal light is as bright as the Milky Way. All of us amateur astronomers are having a blast. A side effect of the wonderful night skies is that the crew is getting fatter. According to the Captain everyone is

sleeping in late and skipping breakfast, so the crew is enjoying all the leftover breakfast food!

Eclipse preparations are in high gear. Vic & Jen helped make solar filters for the 25 or so people who needed them. Fred Espenak gave a talk on the vital statistics of the eclipse, including the Moon's irregular shape and what we should look for. I adjusted my exposure plans to try to capture a double-diamond ring he predicted.

One of my biggest fears about this trip was how the eight days at sea would go. I feared it would be a boring slog, but I have been so busy I have barely touched the books and magazines I brought along. I am keeping busy with obtaining the weather forecasts, and helping other people with their equipment and computer problems. And sleeping. Lots of sleeping. I am starting to recover from my cold.



The rolling of the ship was making it difficult to use my satellite internet connection. I found a solution in prodigious quantities of gaffer's tape, taping the satphone to the ship's upper deck railing while keeping the computer a deck below in the shade. The problems of the world seem far away and irrelevant as I read news headlines.



## Day 9: Thursday April 7, 2005. Sailing west to the eclipse site.



*Courtesy John McKune*



*Courtesy John McKune*



*Courtesy John McKune*

We sailed into the eclipse path at 7:37pm today. At eclipse time (4:17PM ship time, 21:17 UT) we did a dry run of the ship's heading and our equipment. We determined that the best stability is obtained by traveling with the waves and wind, which means a north-westerly direction perpendicular to the eclipse path. This means we are in for some tricky navigation, our Captain will be doing some fancy math to make sure we hit the center of the path at mid-eclipse. Even while traveling with the waves, the ship still rocks about five degrees, so I've pretty much abandoned my original plans for photographing the eclipse. I'll be lucky to get much of anything with the ship rocking that much. Sailing in any other direction causes rolls up to 35 degrees!

I'm getting nervous about the weather, it looks like it will be a close call, possibly with clouds at the start of the eclipse and clearing in time for totality. I begin downloading weather satellite photos every three hours, continuing through the night. It begins raining at about 8 PM and the mood among the leaders is glum but optimistic. At an impromptu midnight meeting with Jen Winter we go over the satellite photos and spot a hole in the clouds coming our way. The only remaining question is whether it will get here in time.



*Courtesy Eli & Dalia Maor*

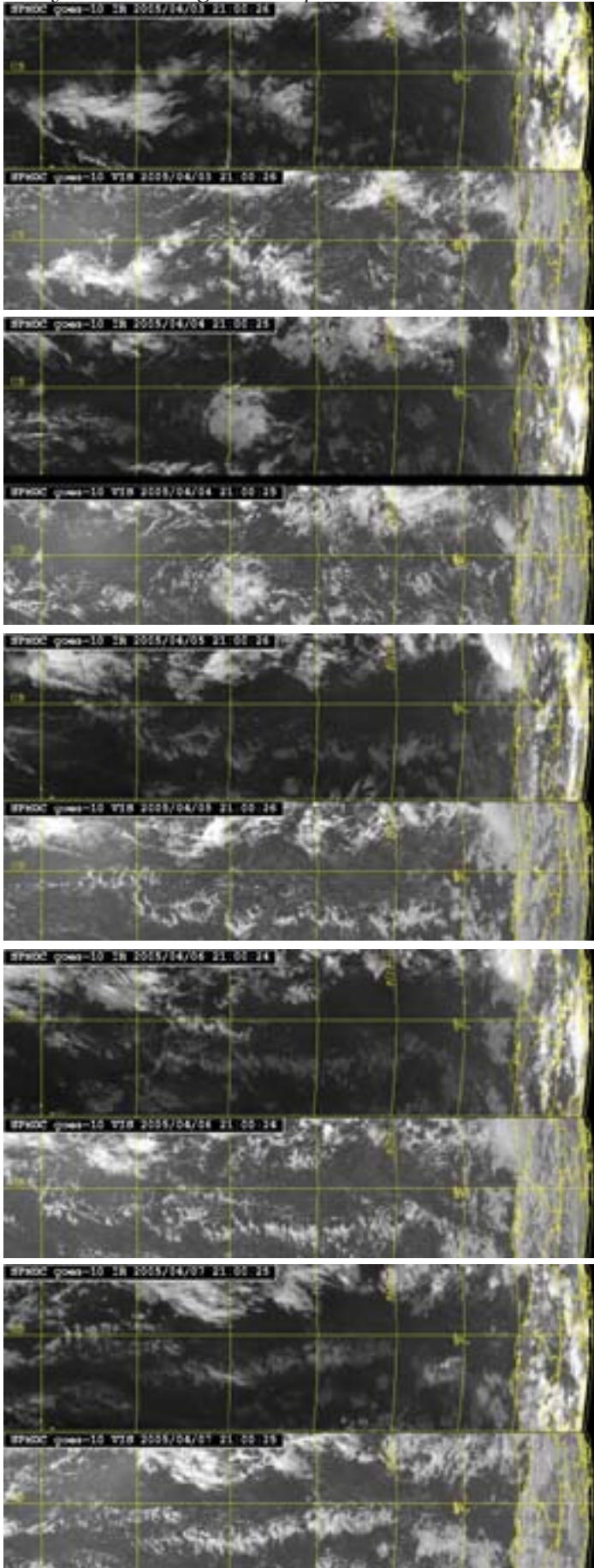
*A practice exposure the day before the eclipse*



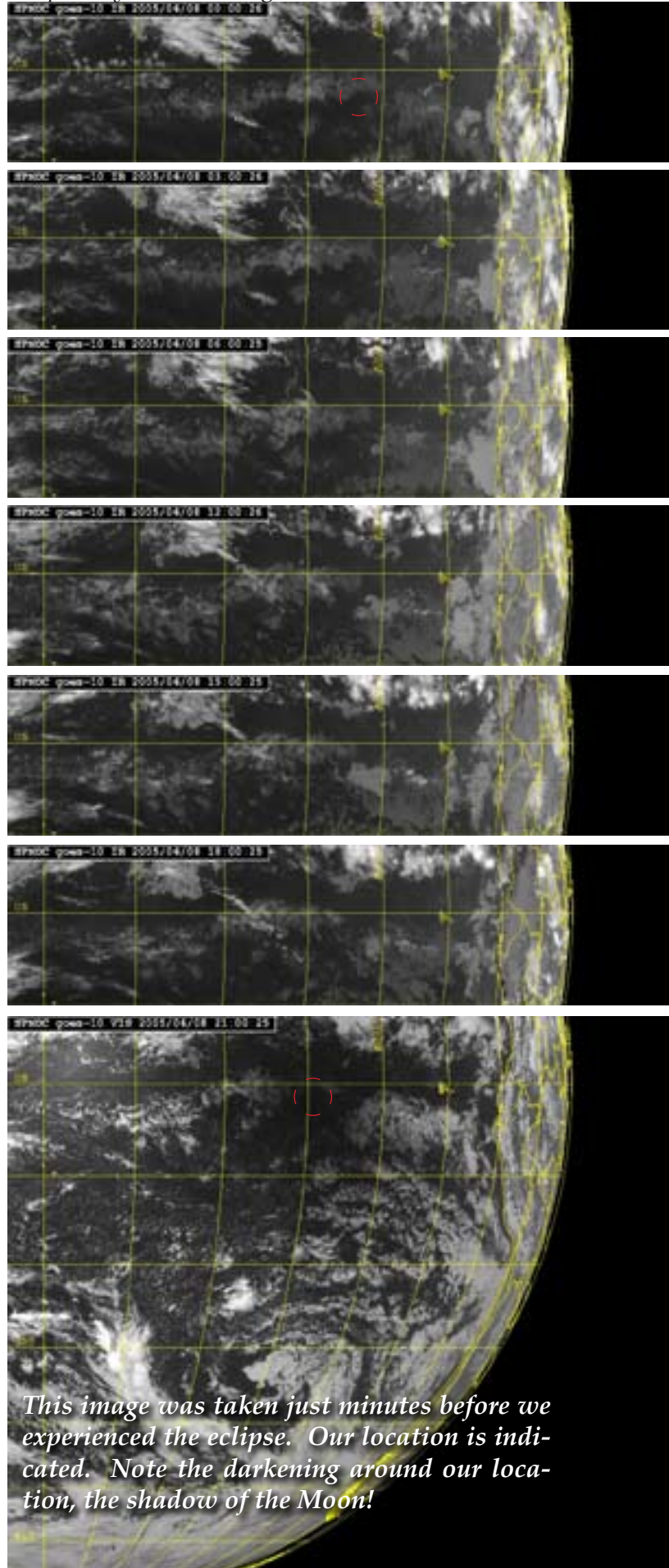


## Weather Satellite Photos

Daily IR/VIS images at eclipse time.



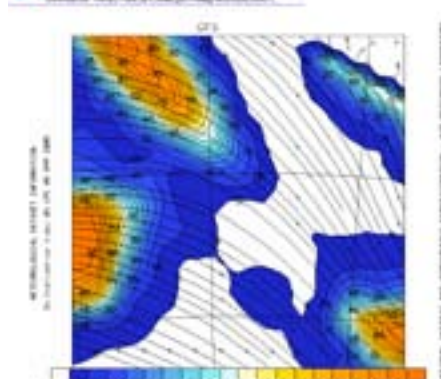
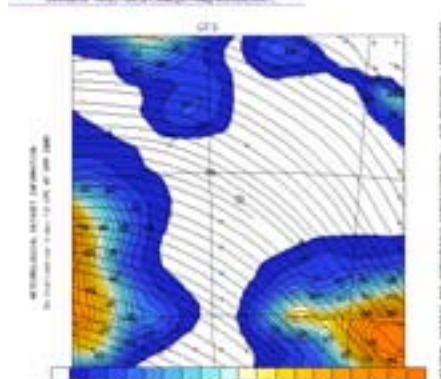
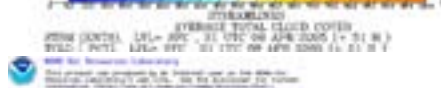
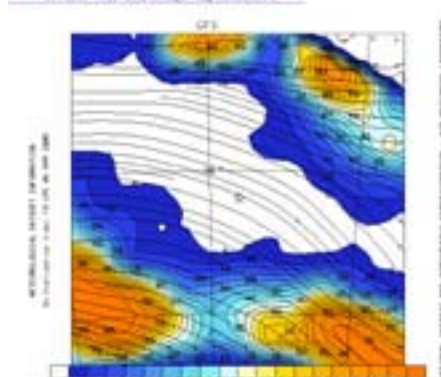
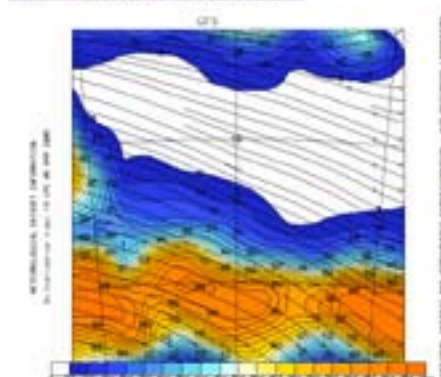
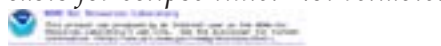
Eclipse day. Our coming hole in the clouds is indicated.



This image was taken just minutes before we experienced the eclipse. Our location is indicated. Note the darkening around our location, the shadow of the Moon!



Various NOAA GFS cloud forecasts for eclipse time. Not reliable.



## Day 10: Friday April 8, 2005. Eclipse day!

The morning started with rain and much nail biting. With a ship we have the luxury of picking any nearby point to see the eclipse. It also means we have the duty to find the BEST point. Forecasts that had been predicting spectacular skies during the past week were revised to progressively worse outlooks after a massive band of clouds decided to jump in front of us. As the sole person on the ship capable of obtaining high quality weather information, it was up to me (Fred Bruenjes) to download and help interpret the satellite images and computer model outputs that would indicate where to find clear skies at eclipse time. In the days just before the eclipse, that meant pulling new data every three hours and continually reassessing our aim point. Meteorology is among my interests so I enjoyed the task.



*Courtesy Olivier Staiger*

We originally targeted 110 degrees west, but several days ago had revised that to 109 west to put more space between us and predicted clouds. As eclipse day neared, it became clear that even 109 west was not going to work. We had two options: head northeast and try to outrun the clouds, or head southwest and speed their passage. On eclipse morning it was heavily overcast and raining. It was too late to head northeast (the ship is slow and would not outrun the clouds), so we (myself, Jen Winter, Fred Espenak, and Olivier 'Klipsi' Staiger) decided to head southwest with no particular aim point. This meant sailing perpendicular to the swells, which would cause the boat to roll side to side up to 30 degrees, so Jen gave a PA announcement for people to batten down. I sat down to breakfast and had to hold my food in front of me.

At 11 AM, I downloaded the latest satellite image from under the cover of my jacket because it was raining. Not a good sign on an eclipse morning. The computer models were now predicting that the clouds

*Continued page 43...*



*Captain Arcos checks the GPS*

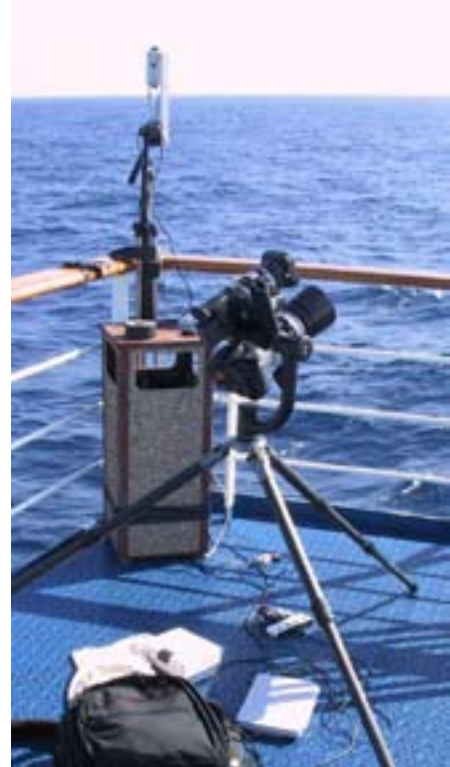




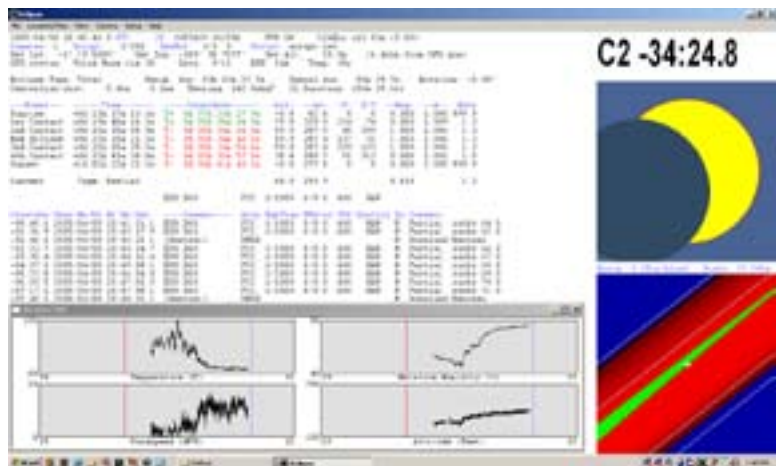
*At left: My video and still cameras, piggybacked using a stock Wimberley Gimbal mount, on a Gitzo tripod. The combination is balanced and turns effortlessly.*

*At right: at top is my fisheye video camera setup to record all sky video. Below is the video and still camera, and below that is the laptop that controls the camera, captures weather data, and syncs to GPS time.*

*Below: A screen shot of my software that controls the camera and Kestrel weather meter.*



*Below: A closeup map of our journey near the eclipse track. Approaching the area, we did a loop to determine the most stable direction. Then the ship continued on the best course and intercepted the track around dinnertime on the 7th. The Captain made a practice run during the night. As morning broke we turned southwest to make a dash for clearer skies. We finally chose 109 30' W as the intercept and met success exactly on the center line. After fourth contact, the ship turned east and headed back to the Galapagos. Map width is 250km (155 mi).*

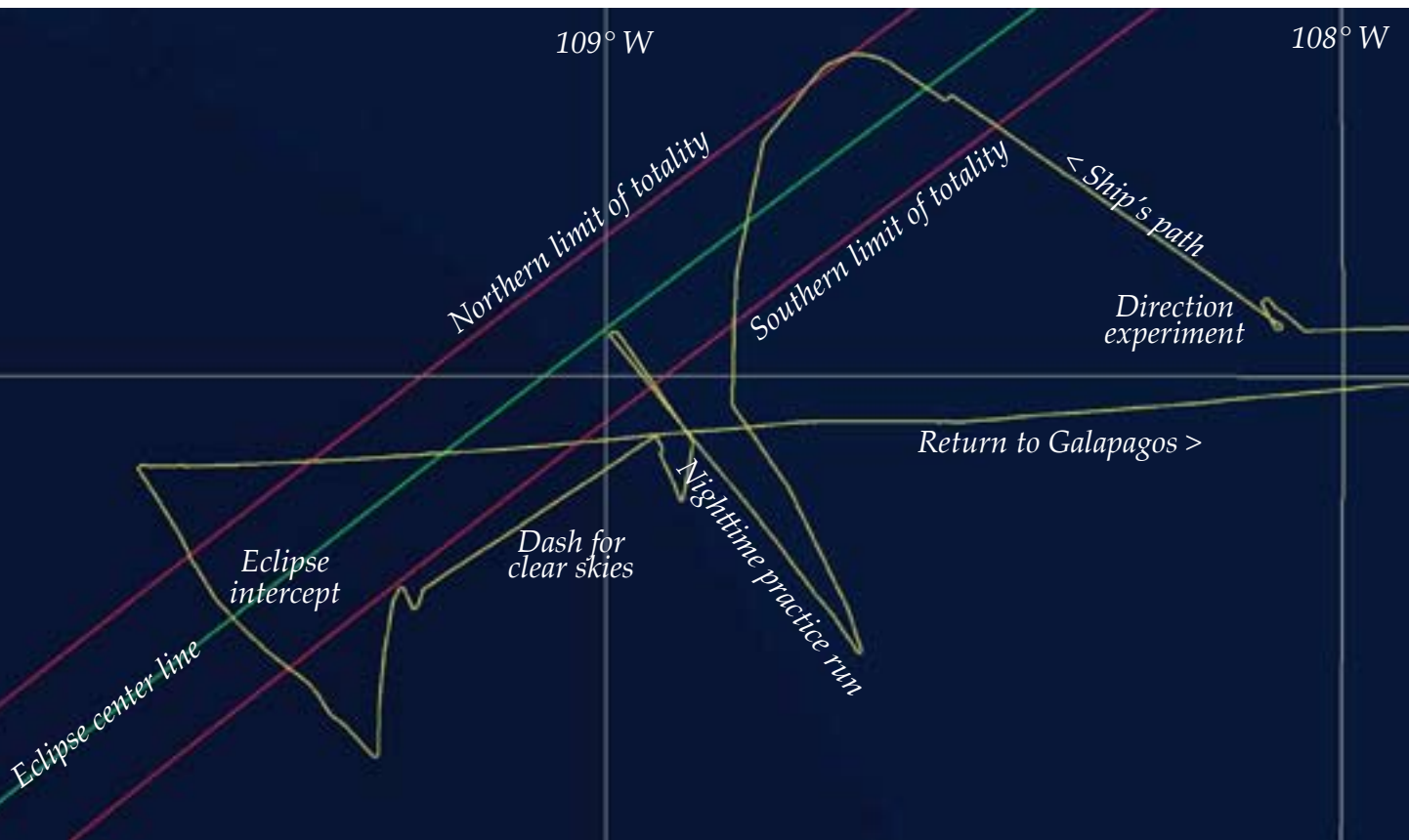


110° W

109° W

108° W

1° S

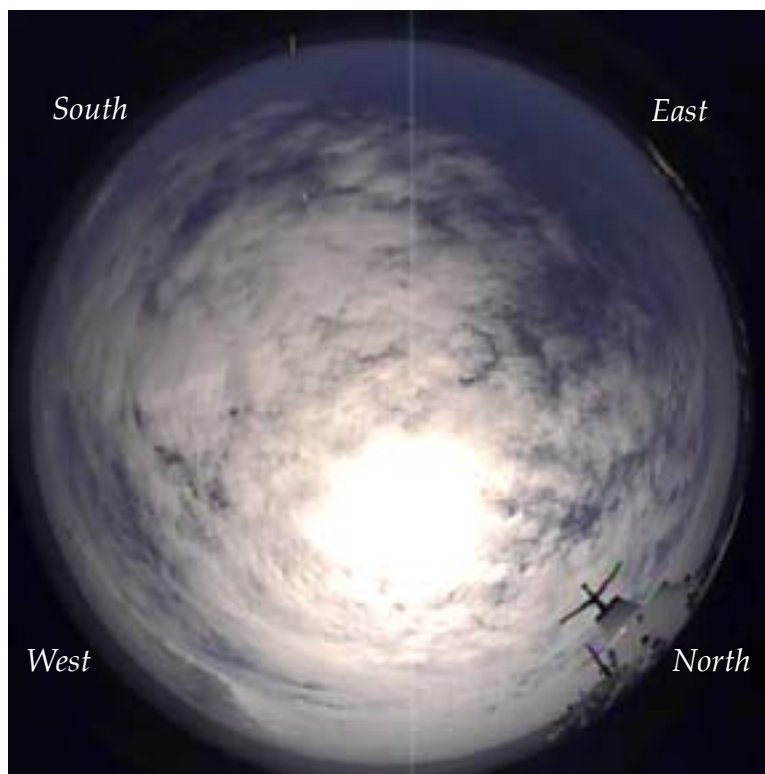




would burn off and the remaining crud would push northwest past us in time for the eclipse, and I could definitely see the hole in the clouds coming on the satellite image. Would it get here in time? The group leaders and myself agreed that we should push as far south as possible, to try and reach the clearing before the eclipse.

As the day progressed, it seemed hopeless. There were multiple cloud layers, occasional rain, and no signs of improvement. I tried to remain outwardly optimistic but inside I was getting nervous and the people who knew me well enough could tell. If those clouds were to clear they had better start moving... and they weren't moving!

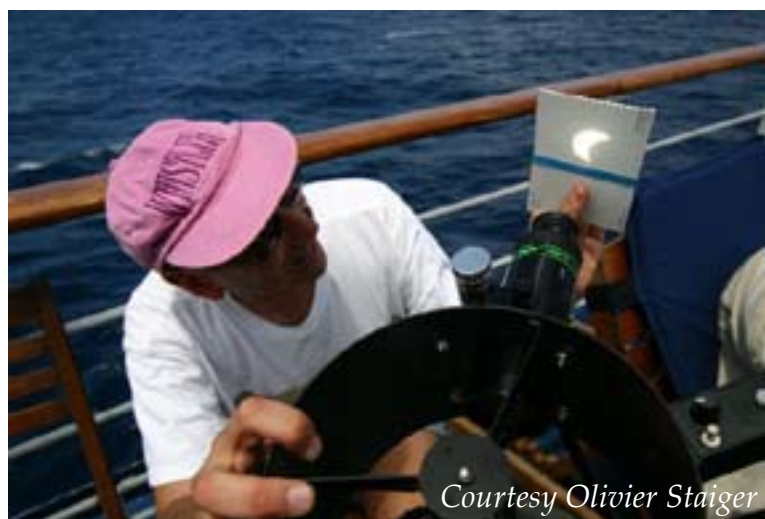
As time ticked down towards the start of the eclipse, we finally got some signs that the



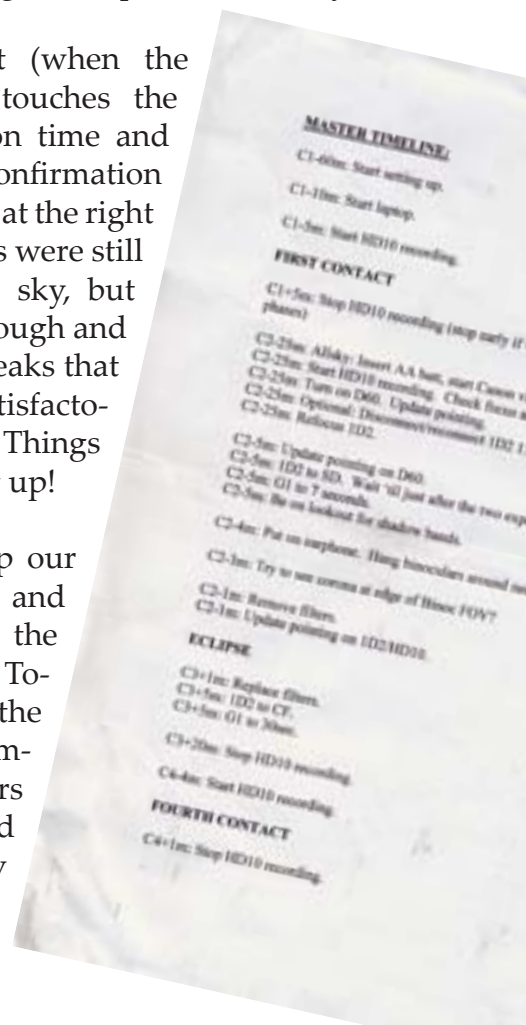
computer predictions were coming to fruition. "Sucker holes" opened in the clouds and we saw flashes of blue sky. The burn off of the upper cloud layer had started. Now we just needed the low stuff to blow out of here. Still moving southwest, Fred Espenak supplied eclipse coordinates and the 109° 30' West intercept was selected. Captain Arcos entered the coordinates into the GPS and got set up for the totality run.

First contact (when the Moon first touches the Sun) came on time and provided confirmation that we were at the right place. Clouds were still covering the sky, but were thin enough and had some breaks that provided satisfactory viewing. Things were looking up!

We all set up our equipment and prepared for the main event: Totality, when the Moon completely covers the Sun and turns day into night.



*Courtesy Olivier Staiger*





*Seven minutes to totality - clear skies at last!*

About 15 minutes to totality, it looked like we would still be covered in clouds, while a nearby area would be clear. Some of us contemplated ordering the ship to steam for the clear area at maximum speed, but it was decided to stick to the plan and view the eclipse from here clouds or not.

In a near miracle, seven minutes before totality the last of the cloud layers cruised past us, heading northwest as predicted but running a little late. Hooray! The sky was clearing at an astounding pace and we were assured our view of totality. To many of the passengers it must have seemed like magic, but it was exactly what we were expecting.

*Second contact**Third contact**Mid-eclipse 360 degree view*



David Levy provided an excellent commentary via microphone and directed us to look for shadow bands, Venus, the corona, and other sights before the eclipse. Shouts of joy from all of the passengers began to drown out all other noises.

The Moon's shadow was seen as a darkening in the southwest and all of a sudden it was upon us. The Sun faded to near nothingness behind the Moon. With my 15x50 binoculars the view was simply glorious. The sky was bright from the unusually narrow shadow, and so the corona (a wispy manifestation of the solar wind) was less bright than previous eclipses, but elongated, with delicate and unmistakable polar brushes that are seen only when the Sun is at a lull in its 11 year activity cycle. The real star of the show was chromosphere and prominences, pink to ruby red 'flames' coming from every direction off the Sun. Normally, the Moon appears larger and only a few of them can be seen at a time, but with this eclipse the Moon was nearly the exact size of the Sun so we saw the prominences all around. The smaller Moon also provided a fantastic show of Baily's

Beads, the best I've ever seen. These occur when the Sun's fantastically bright surface shines just through valleys and canyons on the Moon.

The ship was rolling from side to side because it was at a slow speed. I took off the binoculars and Venus was absolutely dazzling just a couple of degrees above the Sun. I looked around the sky and could see the 360° twilight horizon that is characteristic of a total solar eclipse.



*Courtesy John McKune*

*Left: Composite of partial phases and the double diamond ring*



*Fred Bruenjes observing the eclipse.  
Courtesy Olivier 'Klipsi' Staiger*





*Chromosphere all around!*



I raised my binoculars back into place just in time to see third contact, when the Moon no longer completely covers the Sun. We got a spectacular show of Baily's Beads, including the double diamond ring that Fred Espenak had predicted. Totality had lasted just 30 seconds, but the near perfect view made the long days of hardship worth it. The ship was within 100 meters of the eclipse center line at mid-eclipse time, a perfect bulls eye by our Captain.

*Outer corona and Venus*



After totality we reviewed photos, discussed impressions, and most people began to pack up. The topic of the 2006 eclipse came up only six minutes after this one ended. I stayed, photographing the partial eclipse all the way to the end. I was rewarded for my patience not only by seeing the eclipse from start to finish but also because I saw a whale perhaps a half mile from the ship. It's possible that it experienced totality with us.

Our coordinates at mid-eclipse were  $1^{\circ} 19.554' S$   $109^{\circ} 30.190' W$ , with mid-eclipse at 21:15:22 UTC. Our course was about 320 degrees, speed about 5mph. Totality was 30 seconds.

*Copyright 2005 Fred Espenak*



*My notes of the eclipse*





Near first contact



Just before totality



TOTALITY!



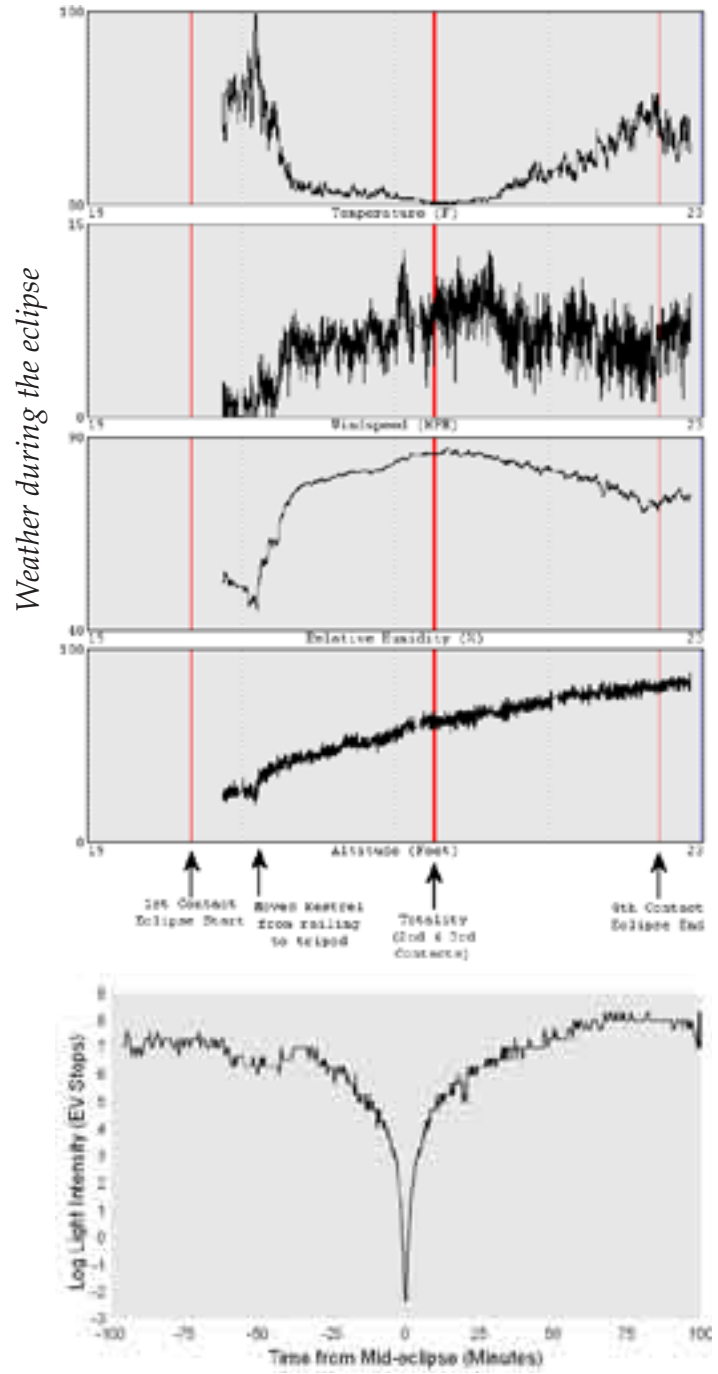
Just after totality



Just after fourth contact



Courtesy John McKune







In the evening a cocktail party was held, and I wolfed down my dinner in order to make it outside in time to see the sunset.

## Day 11: Saturday April 9, 2005. Sailing east to the Galapagos.

Not much went on today. It rained for a good part of the day, as yesterday's hole in the clouds has long moved on. It's been five days since we have seen any sign of humanity.



I spent the day reviewing my pictures and writing my account of the eclipse. I helped a number of people process and/or upload their own pictures. In the evening the Captain invited me to his table for dinner, and I had a nice time chatting with him, his chief engineer Jimmy, and a half-dozen other guests. Everyone is rejoicing and relaxing, and the ship's stores of alcohol are plummeting – both from consumption and from flying off the shelves during the strong swells. People are getting so drunk I'm afraid someone will fall overboard...



*Courtesy Olivier Staiger*







*Severe rolling (compare to left with sky held constant)*



**Day 12: Sunday April 10, 2005. Sailing east to the Galapagos.**

We continued our trek east towards the Galapagos. We saw two fishing boats, some dolphins, and a whale. The day was capped by an amazingly colorful sunset.



*Dolphins*

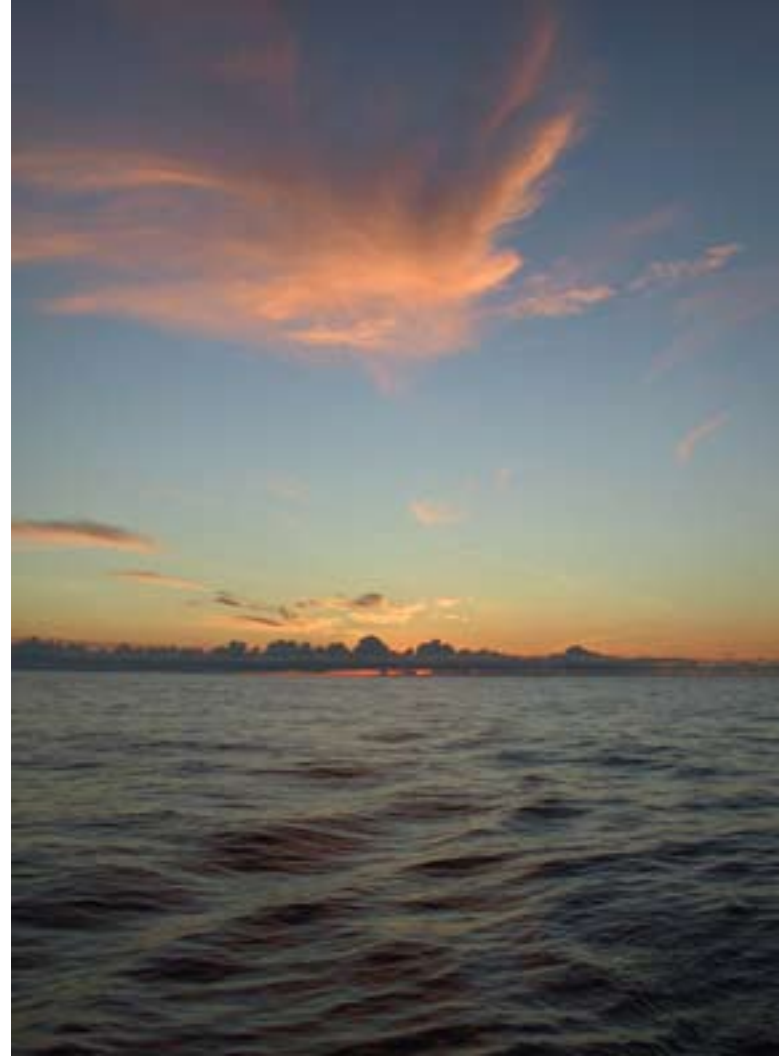






## Day 13: Monday April 11, 2005. Sailing east to the Galapagos.

It's been eight days since any land has been sighted, and I was SO ready to get back to the Galapagos. As a sign of our boredom, sunrise and sunset have taken on epic proportions, they've become must-see events because not much else goes on out here. Dinner was



announced and it was a few moments after walking into an empty dining hall that I realized everyone was delaying dinner so they could see the sunset!

I spent some time today scanning the horizon with my binoculars. In every direction there was nothing but waves. Waves of every size and shape, from small ripples to massive swells that toss the ship. I cannot imagine how sailors of yesteryear and today cope with the months of isolation and monotony.



*Ice cream was exactly what I needed*

We've had an amazing array of special speakers covering everything from astronomy to eclipses to Darwin and the Galapagos. I've been busy almost the entire trip, and skipping a lecture feels like cutting class in college. Still, I've found the best way to pass the







time is to crash onto my bed and sleep the hours away. I've never spent so much time sleeping, and we make jokes about how much exercise we get while sleeping because of the effort it takes to stay in bed - the ship has been in non-stop motion since leaving the Galapagos over a week ago.

The highlight of the day was 'Eclipse Show and Tell' where folks got up and shared their videos,

photos, poetry, and stories of the eclipse and the trip so far. I played my time lapse video of the pool deck, and the all-sky video showing how close we came to being clouded out. Both seemed to be a big hit.



## Day 14: Tuesday April 12, 2005. Roca Redonda and Isla Santiago.

Land ho! We've made it back to the Galapagos. Everyone instantly feels better. Obscene amounts of film and digital memory were used today as we passed several islands on our way back. Starved for wildlife, dolphins, rays, false orcas, sea lions, and a dozen bird species drew everyone to the deck railings. There were no landings today, just several sightseeing stops before positioning for tomorrow's land visit. The rolling of the ship has stopped now that we are in protected waters, but everyone still instinctively holds onto their plates and cups at dinner time.



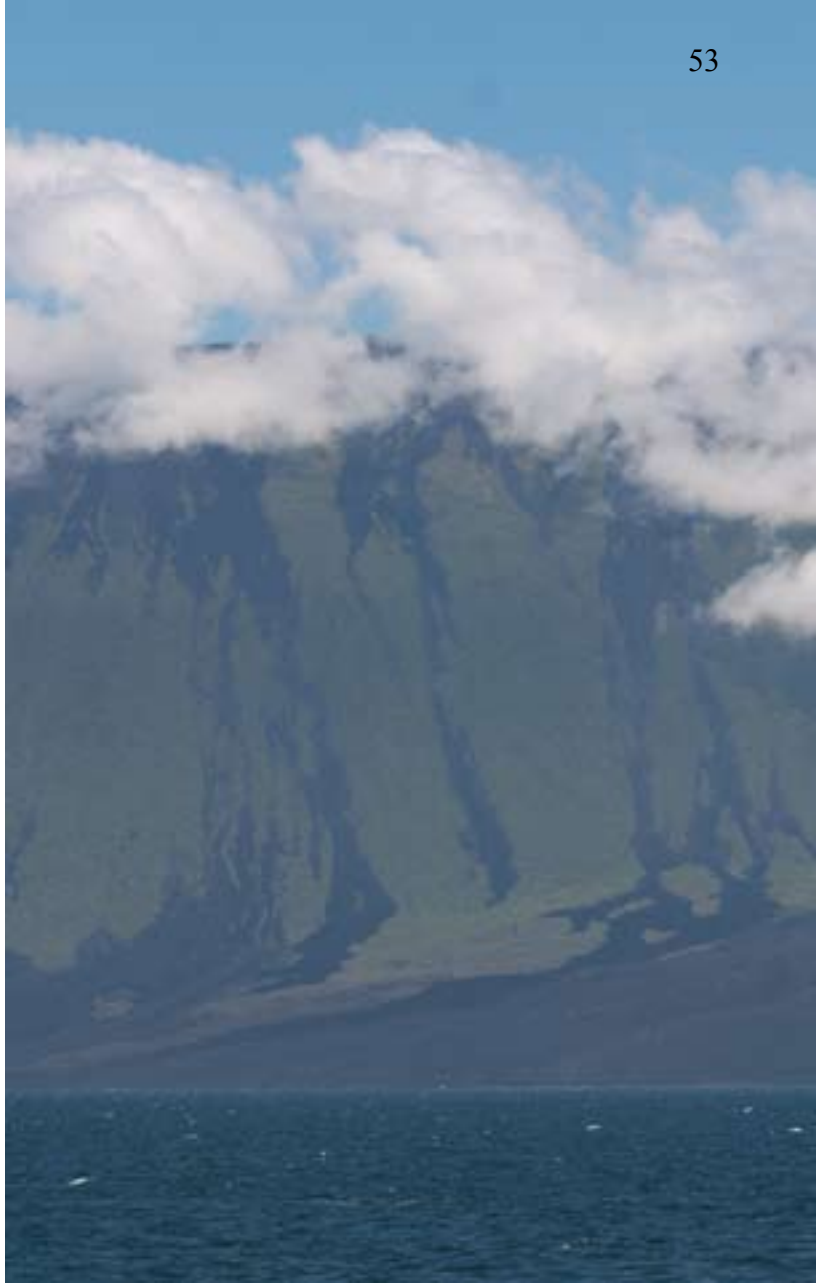








*Volcan Wolf - lava runs down lush forests*



*Cellphone working yet?*

*Crew photo, courtesy John McKune*







*Buccaneer's Bay*







A Neptune Party and eclipse-themed sing-along provided a farcical cap to the day.

(Sung to Home on the Range)  
*...home, home from the sea, and though we saw totality, we rolled and we thrashed, and it cost lots of cash, now home I am ready to be. Eclipse was our quest as we traveled out west, as far from dry land you can get, and we sailed and we sailed, and we sailed and we sailed, and I think that we're still sailing yet. Sunsets were sublime, though we never did find the notorious final green flash, now land's drawing nigh, and the boobies fly by, terra firma I see you at last...*



Courtesy John McKune

*Sea lion attracted to lights at night*





## Day 15: Wednesday April 13, 2005. Isla Santiago and Isla Rabida.

Today we visited land for the first time since April 3rd, at Puerto Egas (James Bay) on Santiago Island and on Rabida Island. We saw the usual assortment of sea lions, Galapagos Hawks, marine iguanas, and various birds.

With our stay winding down, we completed some final tasks. We madly packed our belongings in time for tomorrow's 6 AM wake up call and the final hours on the ship.

Packing at the end of a trip is always harder than at the start, and I had to throw out a bunch of clothes to get everything to fit and stay under the weight limits.







*Great blue heron*















*Isla Rabida*



*Isla Rabida*











We posed for a group photo of the passengers. Later in the evening the crew gave us a farewell presentation, with a slide show of photos taken during the trip.







**Day 16: Thursday April 14, 2005. Isla Seymour to Quito, Ecuador.**



This morning we toured North Seymour Island. We saw hundreds of sea lions and blue footed boobies, and one land iguana. With the whole range of life from penguins to prickly cactus overgrown with lush vines and brush, the Galapagos have provided a stunning variety of enjoyable sights.







*Frigate birds*



















*Rainbow over Quito*



People then began to go their separate ways as the cruise was now over. It was hard to say goodbye to my friends, old and new. I flew from Baltra in the Galapagos to Guayaquil, Ecuador, and then on to Quito. In the afternoon several of us took a tour to the equator, where I got my picture taken with one foot in the northern hemisphere and one foot in the southern, with GPS in hand to prove it. At the equator museum they did a Coriolis effect demonstration where they attempt to prove the location of the equator by draining a sink in various places. It was hilarious because it's a total sham scientifically, and they did it some 120 meters from the REAL equator!

In the evening Bob Shambora arranged a farewell dinner for about 25 of us. It was great to sit down together as a group one last time.



*Quito tour guide Martha*



*We crossed the equator by land, sea, and air on this trip.*





*Coriolis scam: on the "equator" they let water sit so it drains straight down.*



*North of the "equator", they pour water into the left side to set up a clockwise spin.*



*South of the "equator", they pour water into the right side to set up a counterclockwise spin.*



*Attempting to stand an egg on end*



*Carter is not impressed.*





*Left: Google Earth map showing true WGS84 equator (confirmed by three GPS units and Google Earth itself) along with the Inti-Nan equator and the unintentionally inaccurate equator monument.*



## Day 17: Friday April 15, 2005. Ecuadorian Cloud Forest.

Today I took a tour of the cloud forest near Quito. Not to be confused with a rainforest, a cloud forest is at a high elevation and has humid, cloudy conditions nearly continuously. We first visited El Pahuma Orchid Preserve and climbed up slippery mud steps to a waterfall. Then we visited the Nataly butterfly sanctuary in Mindo where we saw them in all stages of life. Finally, after a loong lunch we viewed hummingbirds. It was such a restful lunch that we overstayed and had to rush to have time left to see the hummingbirds.

In an area with such abundant life, it was disappointing to see people show a blatant disregard for life: a car passed a car passing our bus - three vehicles going line abreast around a single lane blind curve! We could also see the poverty, with poor construction and dogs running in the streets everywhere.

*Agave / Century plant*







*Ecuadorian cloud forest*



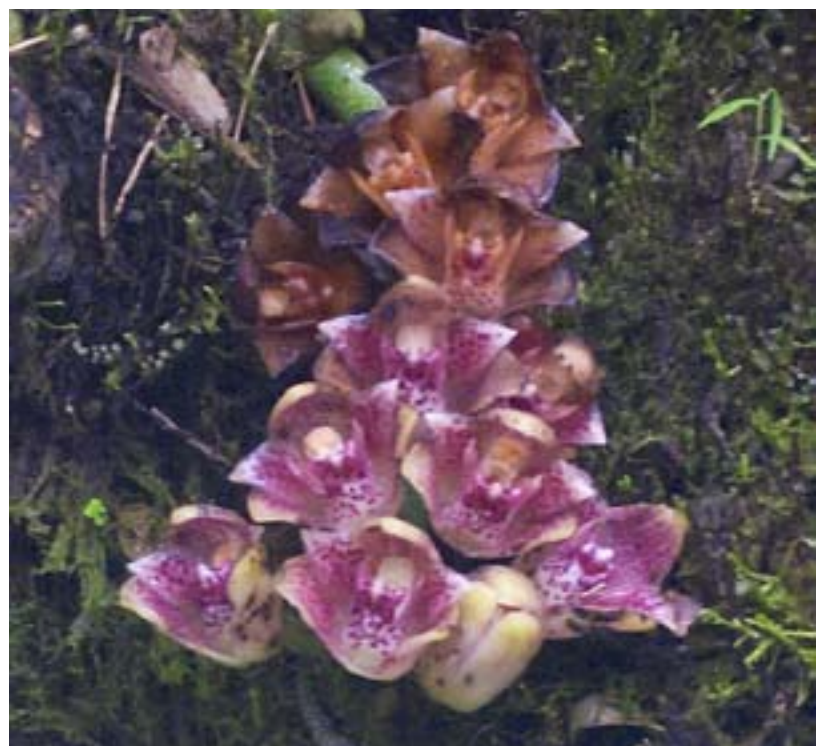




*Las Pozas waterfall*

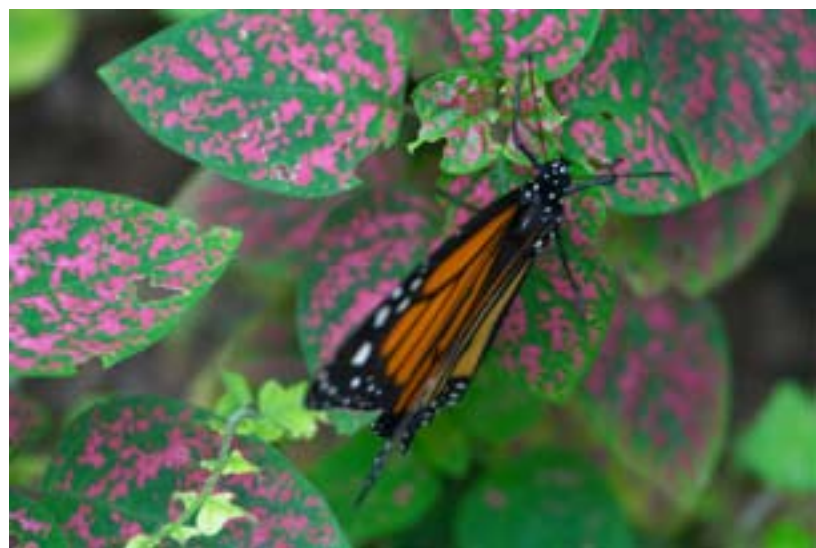








Jardín de Orquídeas  
y Mariposas  
NATALY







*Downtown Mindo*



*After lunch we viewed hummingbirds*







In the evening a cacophony of car horns wafted into our hotel rooms. Ecuador has been in political turmoil in the past few days as the general population has decided to stand up and fight the corruption and conflicts of interest in the government. The car horns are part of a citywide protest and honked nonstop late into the night.



*Honk honk - honk honk honk*

## **Day 18: Saturday April 16, 2005. Quito, Ecuador to San Diego, California.**

I got up at 3:20AM Quito time and flew home to San Diego, California. I got home safe and sound and with all of my luggage.

I came home to about 900 emails, a rude reminder of the over complexity of modern life. My four-digit satellite phone bill was about double what I expected, but that's OK, it made the difference between seeing the eclipse and not seeing the eclipse!

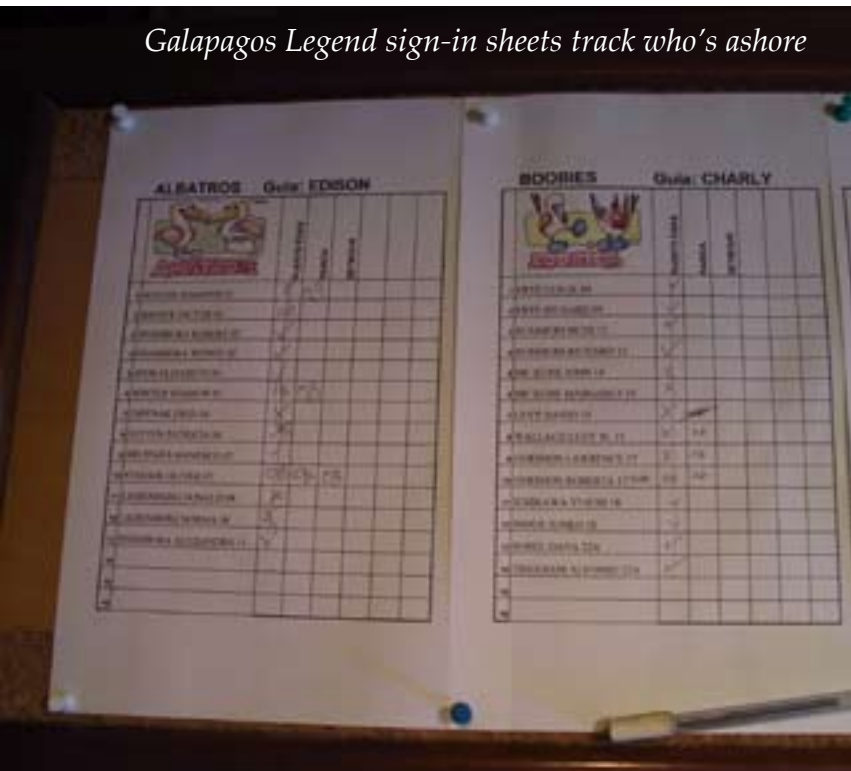
*Goodbye Ecuador*





Eclipse chasing is all about the thrill of the chase and the joy of the journey, and this trip provided both in ample quantities. I want to give a special thanks to the trip leaders and to the crew of the Galapagos Legend for providing such a wonderful experience. Except for the rolling from the waves, I am fantastically pleased with how it all worked out and am planning my next eclipse adventure: a camping trip through the Sahara desert to meet up with the 2006 total solar eclipse.

*Galapagos Legend sign-in sheets track who's ashore*



*Commemorative coin*





## Links to Other Trip Reports

Vic & Jen Winter

[http://www.astronomicaltours.net/2005/GalapagosSlideshow/slide\\_show\\_2005/wGalapagos\\_PreEclipse/](http://www.astronomicaltours.net/2005/GalapagosSlideshow/slide_show_2005/wGalapagos_PreEclipse/)

<http://icstars.com/Galapagos05/JenImages.html>

Fred Espenak

<http://www.mreclipse.com/SEphoto/TSE2005/TSE2005galleryA.html>

Olivier Staiger

<http://eclipse.span.ch/galapagos/galapagos.html>

Hamid Khodashenas (with Khati Hendry and Sally Kilburg)

<http://www.mreclipse.ir/epages/news.aspx>

Fred Espenak processed by Miloslav Druckmüller

<http://www.zam.fme.vutbr.cz/~druck/Eclipse/Ecl2005g/0-info.htm>

Mark Alsip

<http://www.alsip.net/astro/eclipse/2005/index.htm>

Leticia Ferrer

<http://pg.photos.yahoo.com/ph/leticiaferrer/album?.dir=92cc>

[http://www.ferrercom.com/2005Eclipse/default\\_files/frame.htm](http://www.ferrercom.com/2005Eclipse/default_files/frame.htm)

Vojtech Rusin

[http://www.ta3.sk/~vrusin/Galapagos\\_2005/](http://www.ta3.sk/~vrusin/Galapagos_2005/)

(Apologies to anyone else I forgot to include on this list.)