Introduction to the First MAGIC Science Workshop

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BROOKHAVEN NATIONAL LABORATORY

First MAGIC Science Workshop
Brookhaven National Laboratory
Monday, May 5, 2014

Doris Day had a hit song "It's Magic" in 1952.

Goals of Workshop

- Bring everyone up to date on MAGIC activities
- Allow investigators to present results (or preliminary results)
- Determine what areas require attention to move forward
- Establish networking and collaborative possibilities
- Disseminate first-hand knowledge of MAGIC deployment
- Decide on future plans (including next workshop)
- Work on justification for future MAGIC deployments
- Transfer knowledge to improve future marine deployments

~50 registrants including ~12 remote participants

Acknowledgements:

Horizon Lines and the Captain & crew of the *Spirit*

Nicky Hickmon and the AMF2 team and technicians

AMF2 mentors

and lots of other people

Monday Afternoon: Observations and Data

- Introduction
- Context
- Availability
- Issues and concerns

What measurements are there?

Why are they important?

How do they relate to the science?

Where can the data be found?

Are there times when the data are missing?

What should users be aware of when using the data?

Monday Afternoon: Observations and Data

Rick Wagener (BNL) (& Maike Ahlgrimm): *ECMWF data*

Maria Cadeddu (ANL): *MWR data*

Mike Reynolds (RMR Co): *meteorology and radiation data*

Mary Jane Bartholomew (BNL): *Parsivel data (disdrometer)*

Tami Toto (BNL): *ship location and attitude data*

Karen Johnson (BNL): *radar data*

David Troyan (BNL): *ship motion corrections*

Gunnar Senum (BNL): *aerosol data*

Tuesday: MAGIC Science

Science questions that have been, can be, or will be addressed with MAGIC data.

What am I doing?

What can I offer?

What can I share?

What do I need?

Tuesday: MAGIC Science

Xiaoli Zhou (McGill University): *Sc-to-Cu transition*
David Painemal (NASA): *satellite obervations*
Mike Reynolds (RMR Co): *fluxes*
Alexander Marshak (NASA): *hyperspectral observations*
Courtney Laughlin (Penn State): *dual radar retreivals of clouds*

Lunch

Peter Kalmus* (JPL): *MBL energy and water budgets*
Becky Craig (U Mich): *aerosol analysis by microscopy*
Eimear Dunne (AEROCOM): *AEROCOM modeling*
Ed Eloranta* (U Wisc): *drizzle measurements with lidar and radar*
Sasha Smirnov (NASA): *aerosol optical depth*
Ernie Lewis (BNL): *aerosols during MAGIC*

* denotes remote talk

Wednesday: Future Directions

Questions to consider:

What future work can/should be done?

What publications do we see? Should we do a special issue?

Where do we go in the future?

What more could we learn from MAGIC-2?

What are the science questions that still need to be addressed?

Are there "golden legs" – one in warm season & one in cold season?

When/where should the next workshop be? What topics should it cover?

What are the next steps to move forward now?

What do we need to move forward with an intercomparison?

What collaborations can be formed?

What action items are there?

Origin of MAGIC

Joao Teixeira (JPL)

Warren Wiscombe (ex-NASA)

Ernie Lewis (BNL) & Mike Reyonlds (RMR Co.)

MAGIC:
Marine ARM GPCI Investigation of Clouds

ARM: Atmospheric Radiation Measurement, a program of DOE

GPCI: GCSS Pacific Cross-section Intercomparison

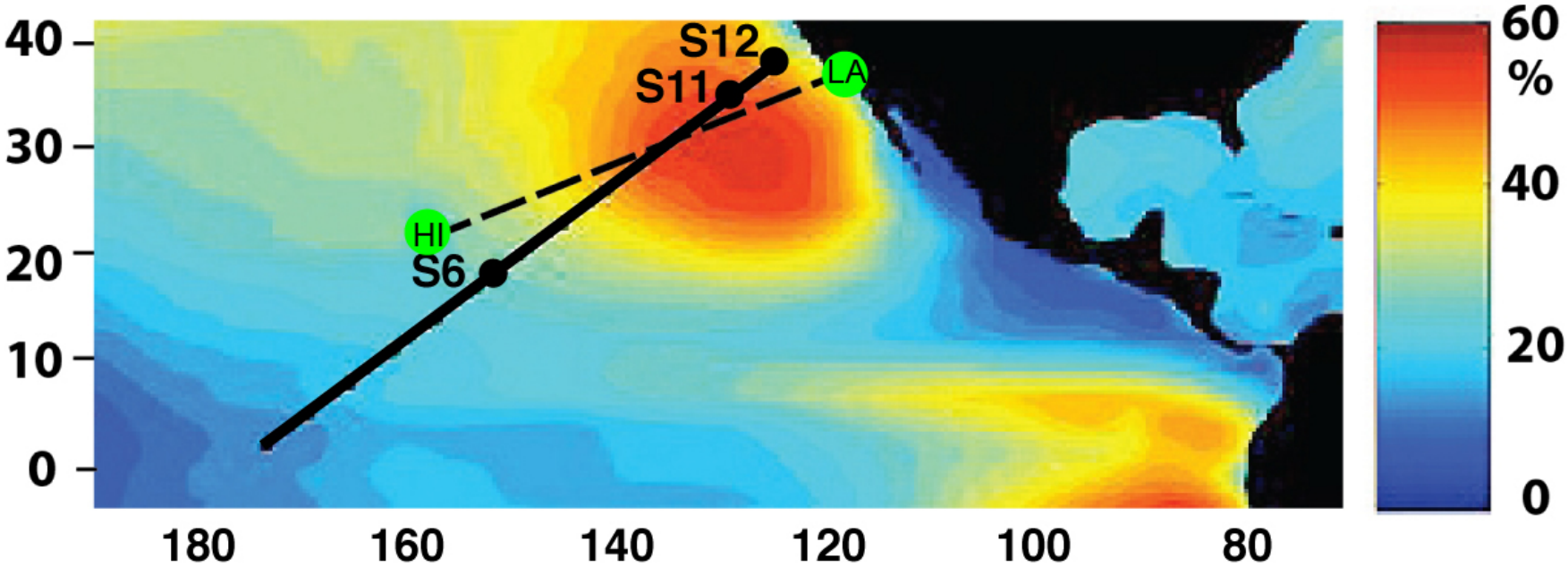
GCSS: GEWEX Cloud System Studies

GEWEX: Global Energy and Water Cycle Experiment

GPCI no longer operational
GCSS now GASS: Global Atmospheric System Studies
GEWEX now Global Energy and Water Exchanges Project

"MAGIC" is easiest

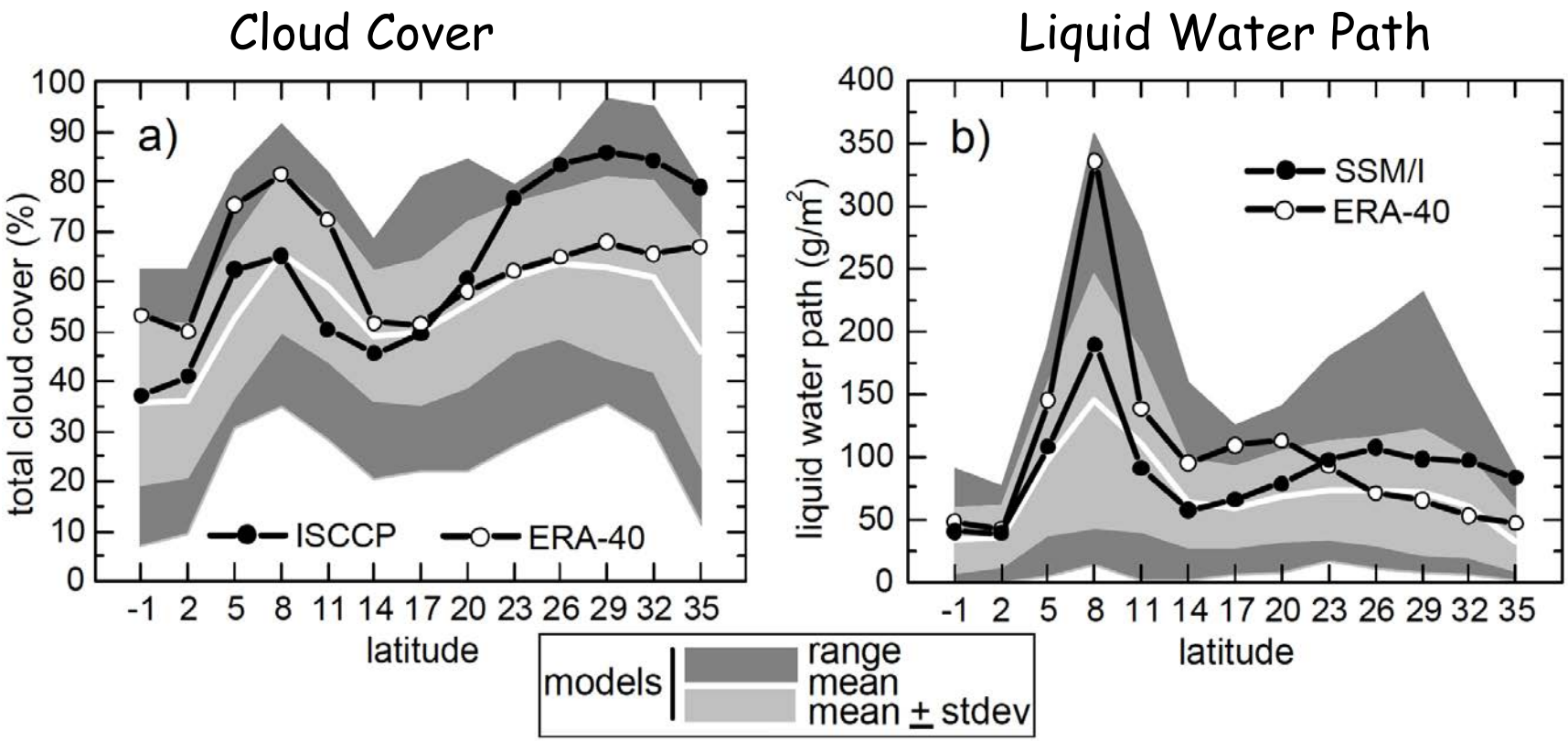
Sc-to-Cu Transition



MAGIC route with annual average low-level cloud cover,
GPCI transect, & CGILS points.

From Teixeira et al., J. Climate, 201:

Models Exhibit *Some* Disagreement



from Teixeira et al., 2011

For JJA 1998 along GPCI

Ensemble results from 23 models; mean plus or minus standard deviation

Range extends from minimum to maximum values.

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GOALS of MAGIC

"*…to improve the representation of the Sc-to-Cu transition in climate models by characterizing the essential properties of this transition*"

"*… to produce the observed statistics of these Sc-to-Cu characteristics corresponding to the deployment period along these transects.*"

This was to be accomplished by measuring:

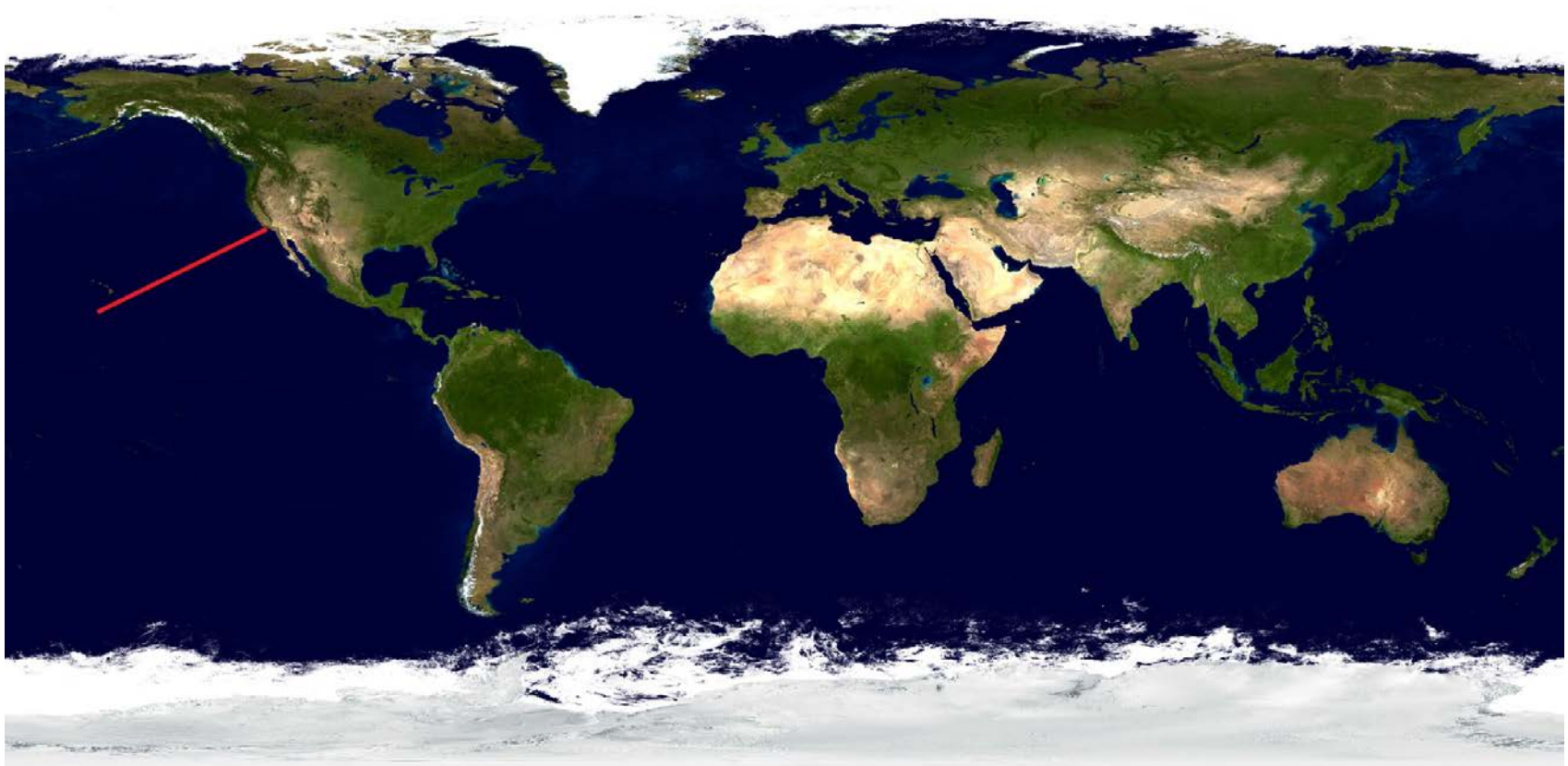
- Properties of clouds and precipitation
- Atmospheric conditions (meteorology and atmospheric structure)
- Properties of aerosols
- Spectral and broadband LW and SW radiation

HORIZON LINES

It all happens here.

MAGIC Transect

- 4100 km from Los Angeles to Honolulu
- Important climatic region (near GPCI transect)
- The *Spirit* makes one round trip every 2 weeks
- MAGIC had ~ 20 round trips and ~200 days at sea



APM TERMINALS
APM TERMINALS
HORIZON SPIRIT
MAERSK

Mark, Tom, Brett, Pat

Nicki Hickmon (ANL) – in charge of MAGIC deployment

What Do These Pictures Have in Common?

Legs

Each Leg is a round trip LA-HI-LA.

Legs are labelled "LegxxA" for LA-HI and "LegxxB" for HI-LA.

Leg0 was an exploratory leg in Feb, 2012.

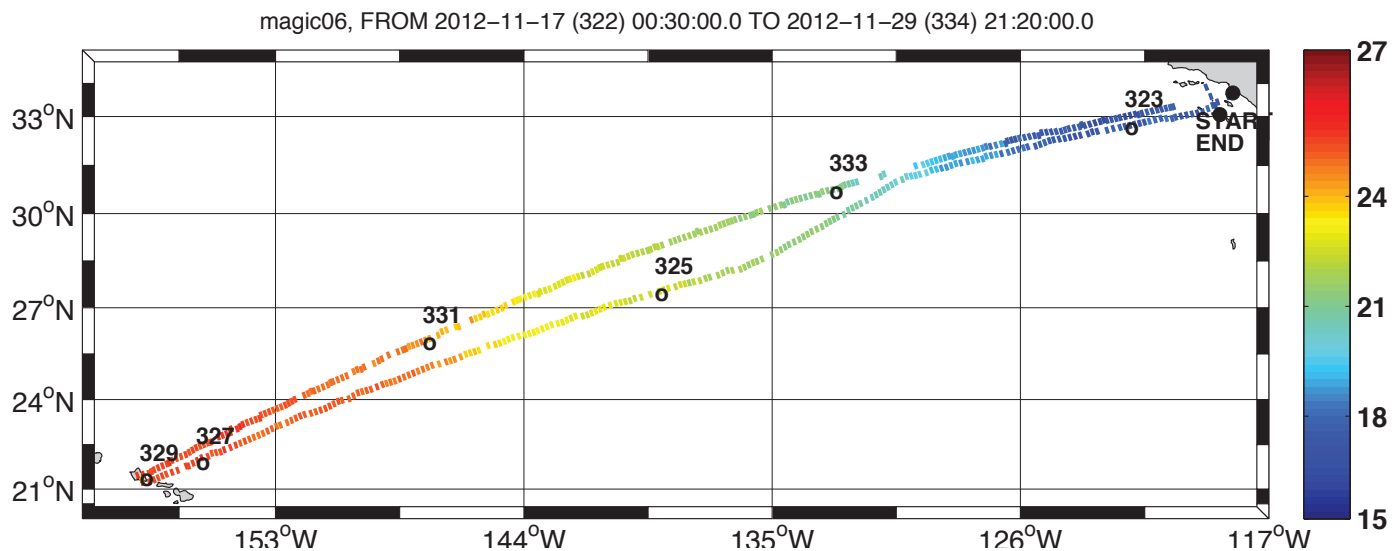
The first MAGIC leg was Leg01B in Sept, 2012.

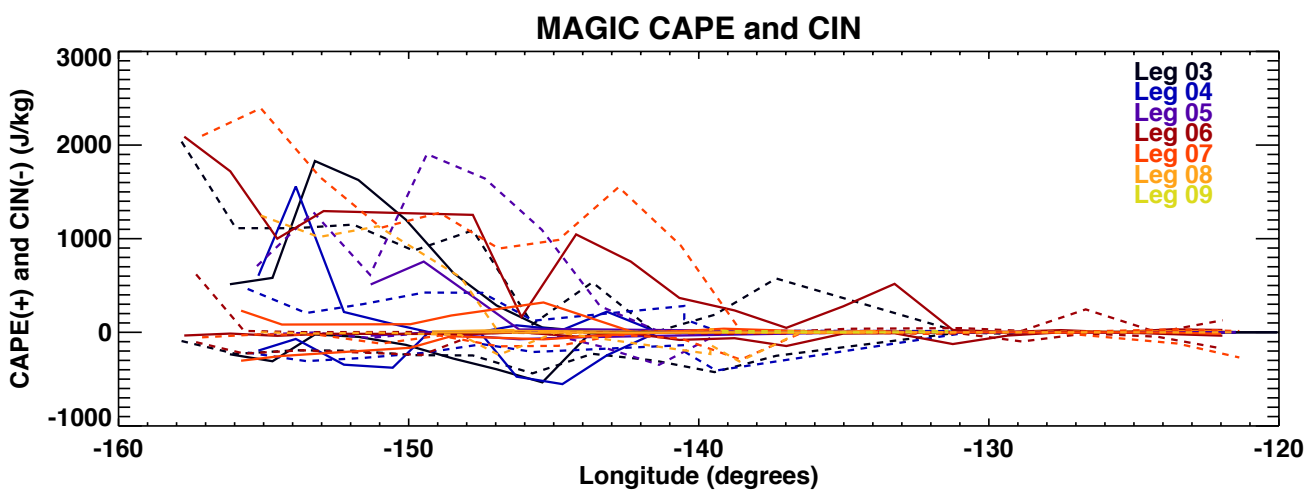
The first phase of MAGIC ended with Leg09B in Jan, 2013.

The second phase of MAGIC (May, 2013 to Oct, 2013) ended with Leg20B.

"Official" dates and times of all legs have been compiled and are available.

Graphs: Longitude for x-axis





Measurements

- Clouds and precipitation
- Meteorology and atmospheric structure
- Aerosols
- Radiation

Instrument status tables compiled from technician notes are available.

There was a high proportion of "up" time for the instruments.

Instrument Status Tables Leg03A-Leg09A

	Leg												
Instrument	**03A**	**03B**	**04A**	**04B**	**05A**	**05B**	**06A**	**06B**	**07A**	**07B**	**08A**	**08B**	**09A**
Ka-band reflectivity													
Ka-band spectra													
W-band reflectivity													
W-band spectra													
Radar wind profiler													
HSRL													
Multipulse lidar													
MWR 2-channel													
MWR 3-channel													
ASSIST													
Total Sky Imager													
Ceilometer													
Portable Radiation Package													
Microtops readings													
CIMEL sun photometer													
Solar Array Spectrophotometer													
Solar Spectral Flux Radiometer													
CPC													
CCN													
UHSAS													
HTDMA													
Wet/dry nephelometer													
PSAP													
Ozone													
Aerosol sampling													
Navigational information													
Meteorology													
Radiosonde launches													
Disdrometers													
IR thermometer													
ISAR													

Instrument Status Tables Leg10A-Leg18B

	LEG																	
Instrument	**10A**	**10B**	**11A**	**11B**	**12A**	**12B**	**13A**	**13B**	**14A**	**14B**	**15A**	**15B**	**16A**	**16B**	**17A**	**17B**	**18A**	**18B**
Ka-band reflectivity																		
Ka-band spectra																		
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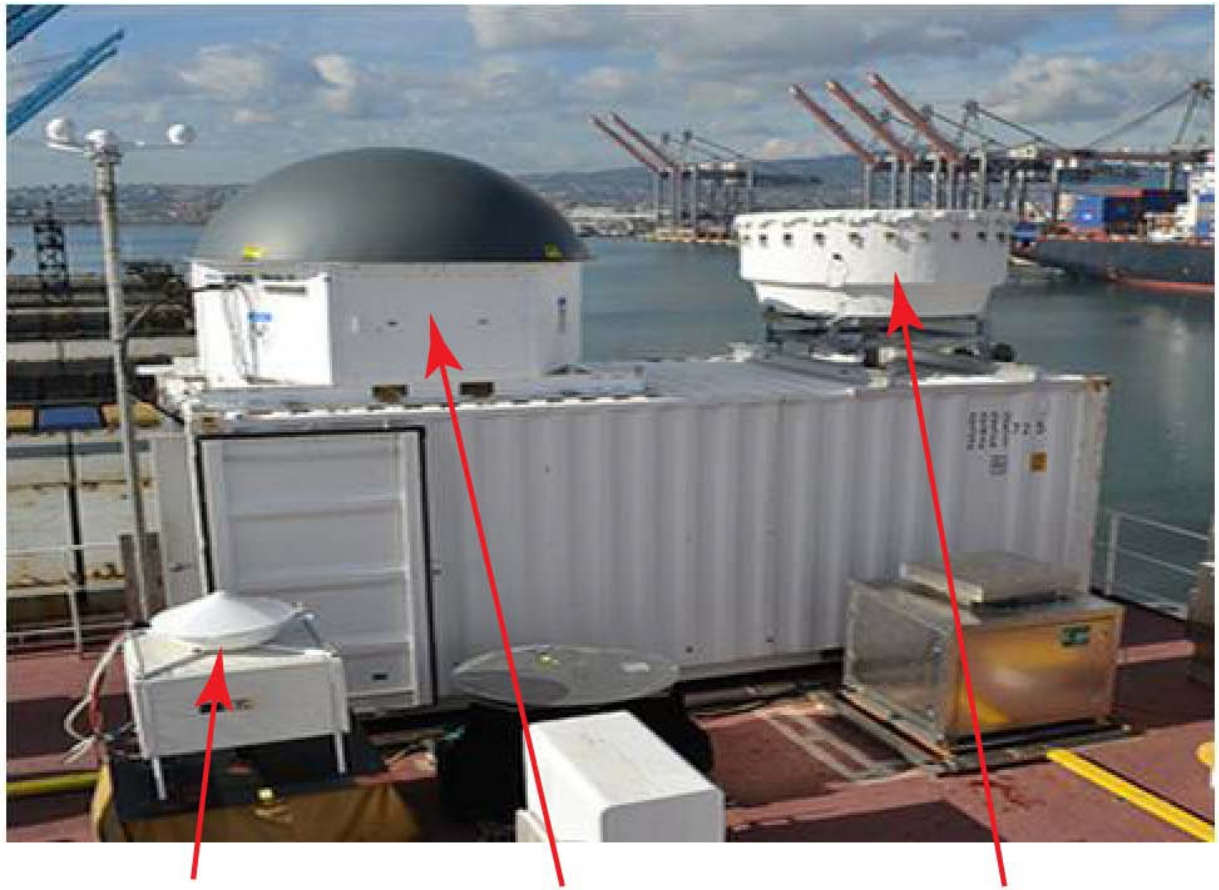
Three ARM Radars during MAGIC



zenith-pointing W-band (95 GHz) on stable table

beam-steerable wind profiler (1290 MHz)

vertically-pointing Ka-band (35 GHz)

Radiosonde Launches

Radiosonde serial number is best way to designate launch.

A list of all successful launches by leg (with date, time, lat, lon) is available.

565 out of 695 attempts => more than 80% success!

Successful launches at relative winds > 20 m s^{-1} !!

Sonde Launch Spreadsheet

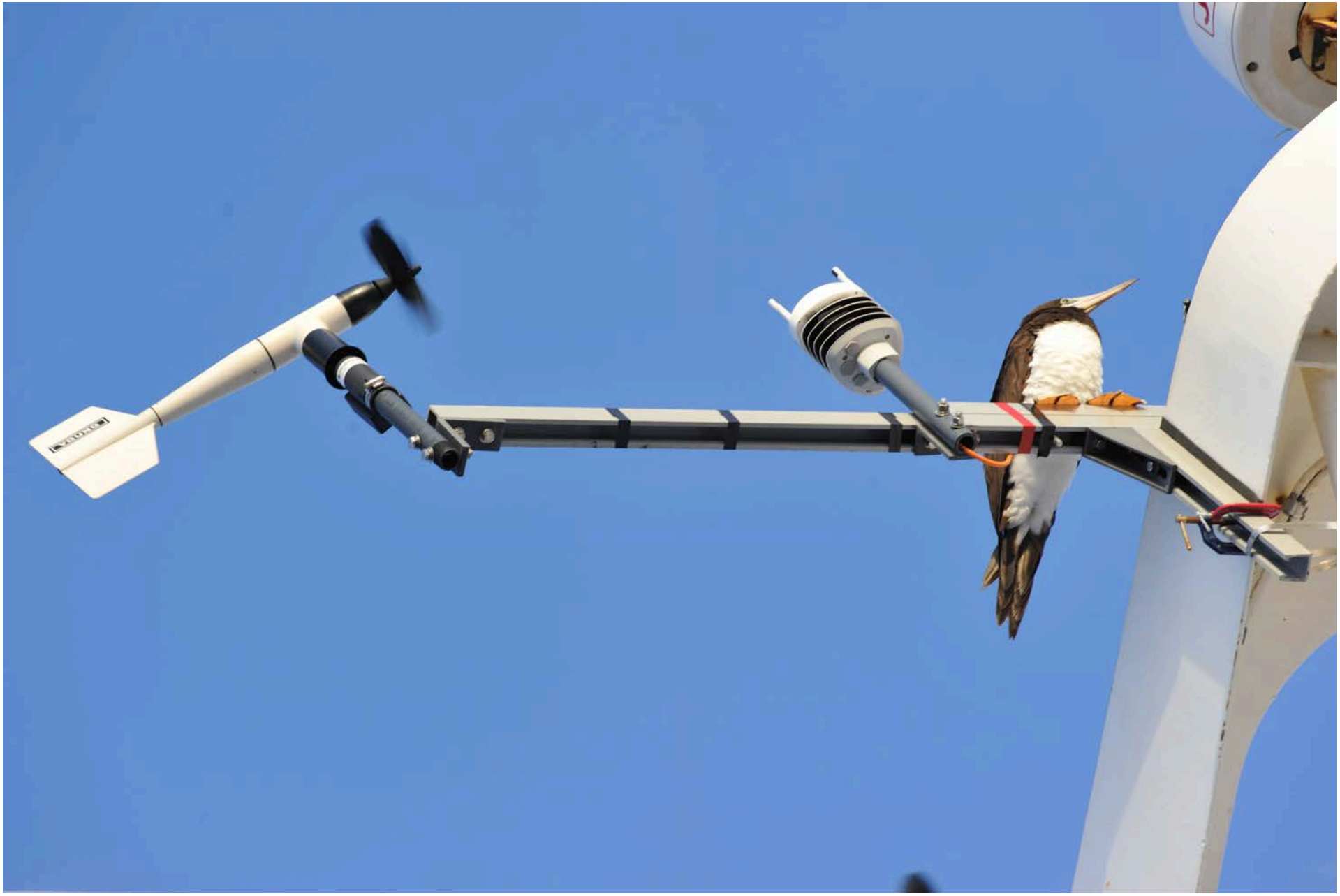
launch date	launch time UTC	surf TempC	surf RH%	wind dir	**rel ws m/s**	nits	max ht km	min Pmbar	comments
at end of cruise please email to elewis@onl.gov									
thank you									
20121020	1800	15.5	89.9	052	**23.9**	TF			Terminated after launch
20121020	1820	15.6	85.1	060	**24.1**	TF	17.800	79.6	
20121020	2335	16.5	94.7	070	**22.7**	TF			Terminated sounding due to high
20121021	0530	17.2	82.4	031	**12.7**	TF	28.700	13.9	
20121021	1130	7.8	77.2	021	**7.8**	TF	26.900	18.3	
20121021	1730	18.9	70.9	004	**9.7**	TF	28.529	14.3	
20121021	2330	20.1	74.0	353	**11.4**	TF	27.686	16.2	
20121022	0530	19.9	80.2	350	**10.9**	MS			
20121022	1130	20.7	77.6	013	**15.1**	TF			Terminated sounding. Sonde hit
20121022	1730	21.5	68.2	020	**11.7**	TF	27.450	16.8	
20121022	2330	20.7	81.2	033	**2.5**	MS	25.698	22.1	
20121023	0530	20.7	87.9	066	**0.9**	MS	25.697	22.1	
20121023	1130	22.1	77.3	350	**4.7**	MS	27.028	17.9	
20121023	1730	22.5	76.2	294	**5.5**	TF	26.754	18.7	
20121023	2330	23.8	74.0	342	**11.7**	TF	27.814	15.9	
20121024	0530	23.9	70.2	323	**7.3**	TF	27.639	16.4	
20121024	1130	23.7	73.4	343	**5.0**	TF	26.399	19.7	
20121024	1730	24.3	68.6	318	**12.3**	MS	28.175	15.0	
20121024	2330	25.0	71.6	301	**10.9**	MS	28.581	14.0	
Arrivied in Hawaii 25Oct2012 061									

MAGIC

Meteorological System

HORIZON SPIRIT

NERA


WIND

Additional Activities during MAGIC

Aerosol sampling for chemical composition and morphology, ice nuclei, RNA
> 180 24-hr samples

Paul Lawson/SPEC flyover attempt

Solar Spectrum Flux Radiometer

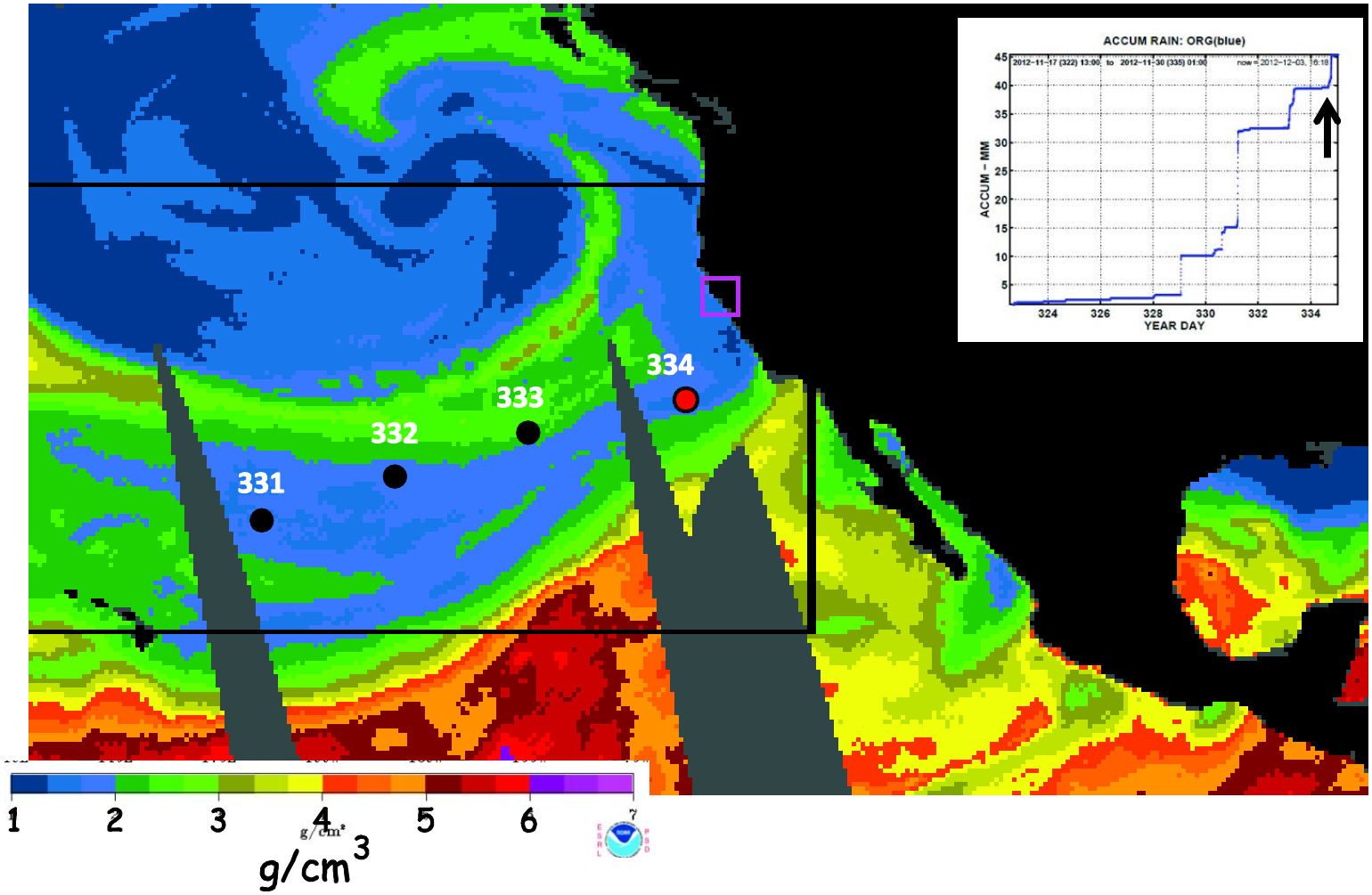
Microtops aerosol optical depths

CIMEL sunphotometer in cloud mode

Atmospheric Rivers

Marty Ralph

Julian Day 334 (AM) – 29 Nov 2012



MAGIC Data

Freely available to all at www.archive.arm.gov.

Video on use of ARM archive at
http://www.youtube.com/watch?v=xHIRXwGyrOs&list=UUYwRLlD9RZGZcKO9882B3ig&feature=em-share_video_in_list_user (starting at ~7:00)

I have files of:

- Start/stop times for legs
- Instrument status tables
- Radiosonde launches

Also, readme documents to explain topics.

Additional Information

Ernie Lewis: elewis@bnl.gov

Websites:

http://www.bnl.gov/envsci/ARM/MAGIC/

http://www.rmrco.com/cruise/magic/

http://www.arm.gov/campaigns/amf2012magic

http://www.arm.gov/sites/amf/mag/

Thank you!