



**Is the World Going Flat?  
*A Quick Look at Flat Panel Antennas  
and  
Radome Love***

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# HiSeasNet – 5 earth radii View



- UC San Diego - SIO SOMTS based project to bring full-time, scalable bandwidth Internet connections to ships at sea in the University-National Oceanographic Laboratory System (UNOLS) community.
- Currently twelve ships:
  - Two with C and Ku systems, Six with C, 3 with Ku only
- Lease dedicated space segment on global C-band, and Ku footprints that cover the majority of the Atlantic, Pacific and Indian Oceans
- Use five satellites: IS-23 (Atlantic), IS-34 (Atlantic), IS-18 (Pacific), Intelsat Galaxy 18, IS-17 (Indian)
- Operate and maintain the earth station on the roof of San Diego Supercomputer Center at UC San Diego
  - Two 7.2 meter dishes for C-band and one 3.8 meter Ku-band
  - Network Access Point for commercial ISPs, CENIC, Pacific Wave, and Internet2
  - Staff have strong university and navy research and development background

# HiSeasNet Radome Love



**R/V Atlantis**



**R/V Neil Armstrong**



**R/V Marcus G. Langseth**



**R/V Roger Revelle**



**R/V Sikuliaq**



**R/V Oceanus**



**R/V Thomas G. Thompson**



**R/V Sally Ride**



**R/V Walton Smith**



**R/V Kilo Moana**



**R/V Endeavor**

# Real Radome Love – R/V Investigator





# Motivations to Investigate Flat Panel Antennas



- Low Weight
- Low electrical power requirement
- No or fewer moving parts
- Software defined, phased array technology or metamaterials
- Quickly deployable
- Disaster recovery
- Tactical operations
- Short term service need
- Cost competitive (if they work for your application)
- Aesthetically appealing
- LEO ready capabilities - YMMV
- They are cool

# Flat Panel Antenna Manufacturers



**Thin Kom ThinSat 300**



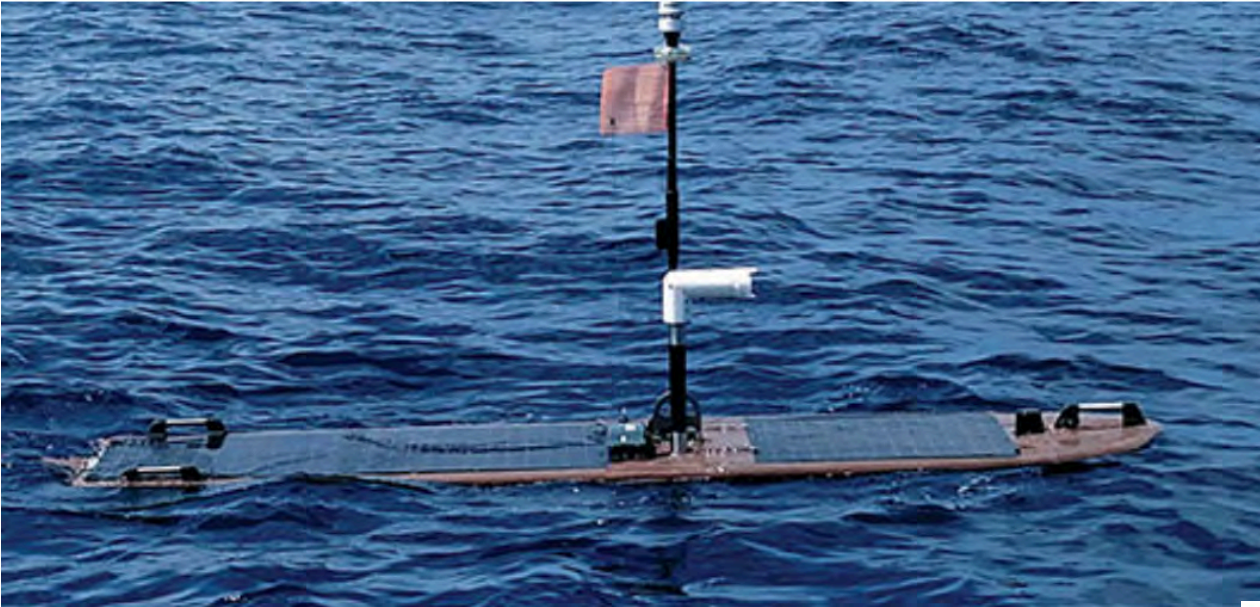
**Kymeta Mtenna**



**Phasor ESA**

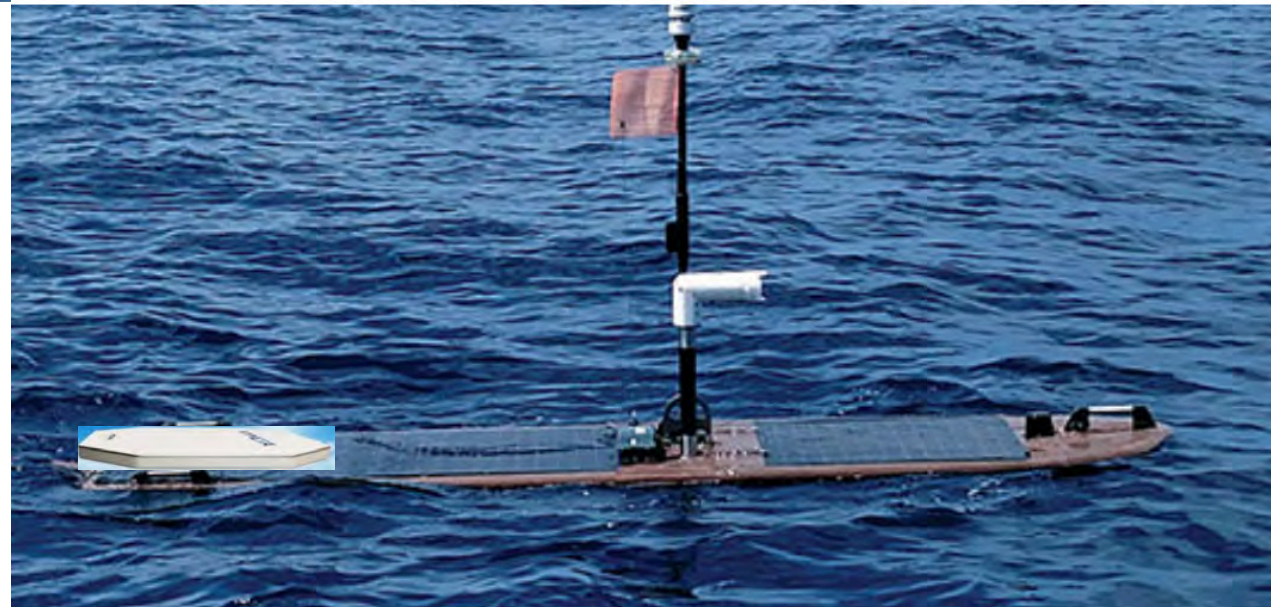


# Exploratory Use Case – Ocean Surface UV



Submitted DURIP Proposal

- Engineered adaptation
- Reduced power
- Increased data rate
- LEO Risk Reduction





# Preliminary Hands On Testing Redmond





# COTM Use cases – land, sea and air



# Summary of relevant specifications



Manufacturer	Weight	Size	Parabolic Equivalent	Band(s)	Tracking speed	G/T	EIRP
Thin Kom	120 lbs w BUC	59"x3"9x4.3"	88cm/36cm	Ku	100 deg/sec	10-13 dBK	49-52 dbK
Kymeta	20 lbs	32.4"x32.4"x.2.8"	60 cm	Ku	20 deg/sec	9.5 dBK	37.6 dbK
Phasor (6 module)	26.5 lbs w/o BUC	42.1."x36.3"2.6"	70 cm	Ku	200 deg/sec	14.3 dBK	53.6 dbK

# Summary



- Flat panel antenna technology is an emerging technology
- Fewer or no moving parts
- A combined transmit-and receive-capable aperture has potential to be LEO ready
- Maritime use requires operating in footprint area with favorable elevation angle. (compared to parabolic) – until LEO and microsats arrive
- Flat panel antennas may worth a closer look for coastal and regional vessels with modest data rate requirements
- Further testing required



# Thanks to our resource sponsors



# Thanks for your attention!



***“Captain – The crew were given the choice of better food or better Internet.***

***All but the cook chose better Internet.”***

**-Chief Mate Quicksort, RV Petasail**