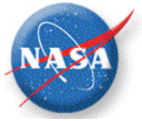


ALOS K&C update

Bruce Chapman, Jet Propulsion Laboratory
California Institute of Technology

The impact of temporal decorrelation on InSAR vegetation 3-D structure retrieval algorithms

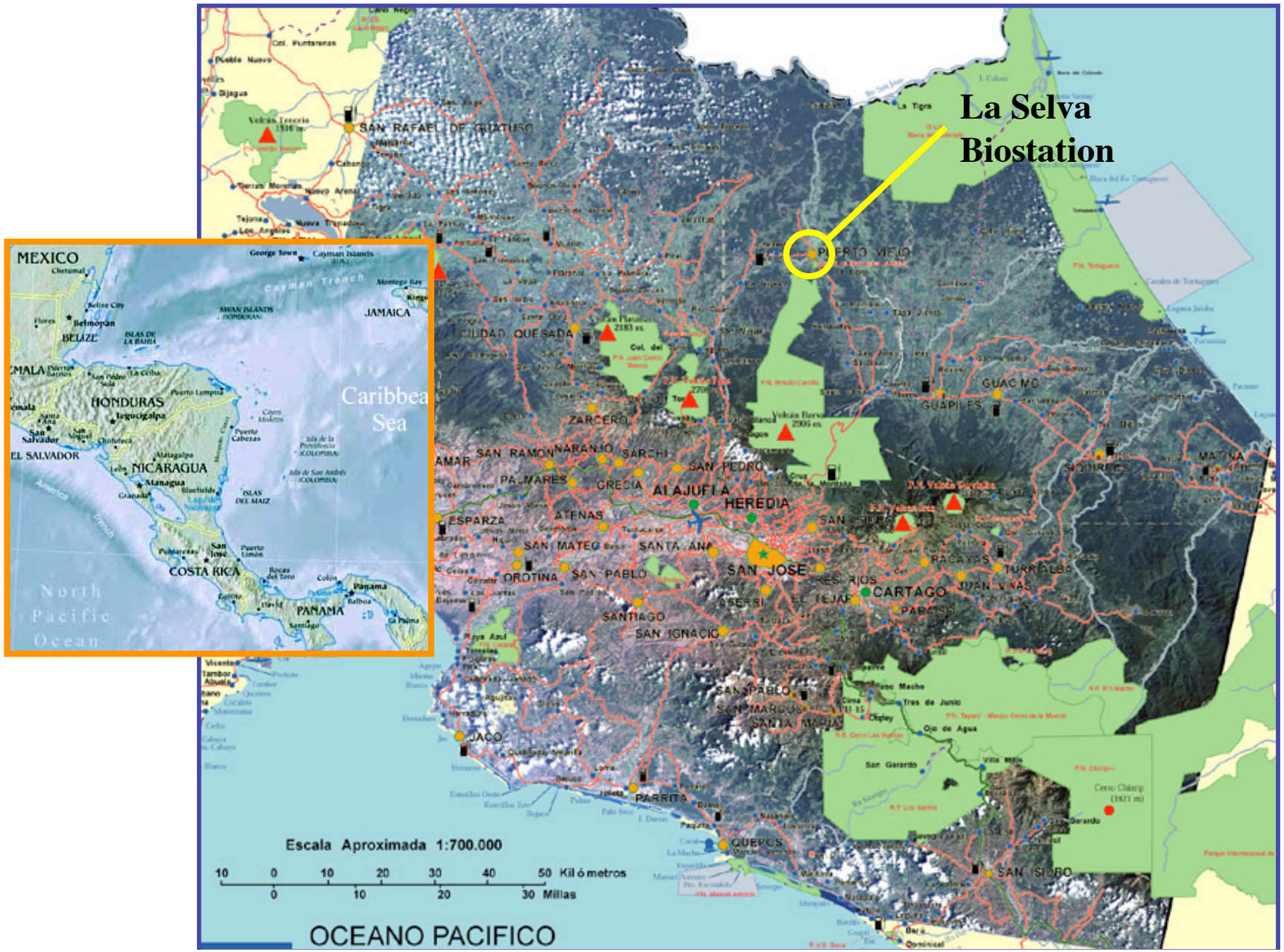
- Paul Siqueira (UMASS), Bruce Chapman and Scott Hensley (JPL)

- This project was funded last summer.

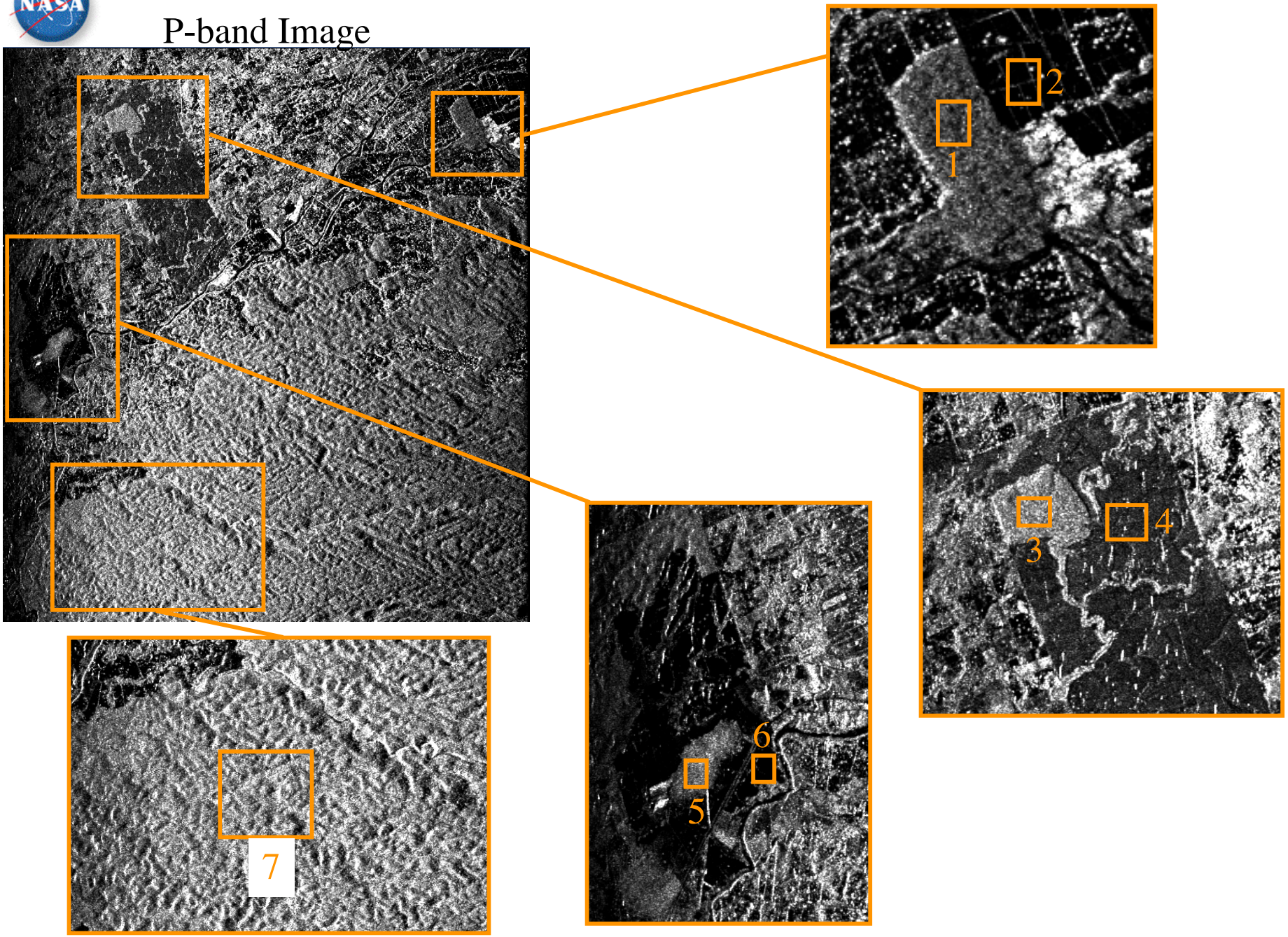
Temporal Decorrelation

- AIRSAR campaign March 2004, La Selva, Costa Rica
  - Single pass InSAR, and 20 minutes, 3hr, 1 day, and 2 week repeat pass InSAR
  - A dozen flightlines resulting a variety of physical baselines.
- Re-processing of Seasat 3 day repeat data over the USA
- ALOS 46 day repeat pass data

La Selva Experiment Location



Regions Used for Correlation Studies



Correlation Statistics for Various Regions

Region	Polarization	P-Band				L-Band			
		20 minute		3 day		20 minute		3 day	
		20 m	90 m	10 m	104 m	20 m	90 m	10 m	104 m
		296-1 296-2	296-10 296-11	296-1 296-11	296-1 296-10	296-1 296-2	296-10 296-11	296-1 296-11	296-1 296-10
1	HH	.69	.60	.55	.53		.35		
	HV	.46	.51	.43	.44		.33		
	VV	.56	.54	.45	.47	.40	.34	.48	.29
2	HH	.62	.67	.59	.54		.79		
	HV	.35	.40	.35	.34		.70		
	VV	.50	.61	.52	.47	.76	.72	.37	.55
3	HH	.71	.40	.55	.44		.34		
	HV	.63	.37	.45	.35		.34		
	VV	.68	.38	.49	.39	.36	.34	..40	.29
4	HH	.93	.93	.86	.81		.81		
	HV	.87	.87	.80	.75		.74		
	VV	.89	.92	.85	.80	.71	.71	.67	.39
5	HH	.87	.72	.86	.69		.47		
	HV	.81	.53	.70	.53		.44		
	VV	.80	.54	.73	.54	.59	.45	.54	.36
6	HH	.82	.75	.75	.68		.65		
	HV	.56	.46	.43	.42		.60		
	VV	.83	.61	.62	.64	.79	.66	.34	.59
7	HH	.69	.43	.57	.41		.34		
	HV	.66	.42	.55	.38		.33		
	VV	.65	.41	.53	.38	.37	.34	.30	.29

(From Hensley et al, 2006)

Mapping Wetland Dynamics

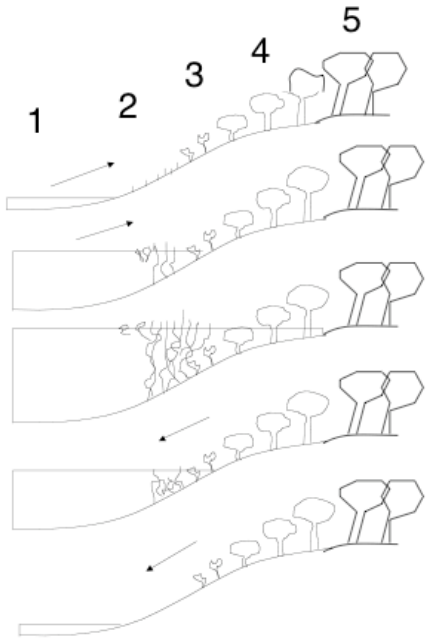
Bruce Chapman (Jet Propulsion Lab, California Institute of Technology), Paul Siqueira (UMASS), Masanobu Shimada (JAXA),Ake Rosenqvist (JRC), Bruce Forsberg (INPA), Maycira Costa (UVIC),Kevin Telmer (UVIC)

Proposal submitted January 2006. Still waiting for it to be reviewed!

- Use ALOS PALSAR data to monitor and validate flooding extent in the Amazon river basin and Pantanal region

Mapping Wetland Dynamics

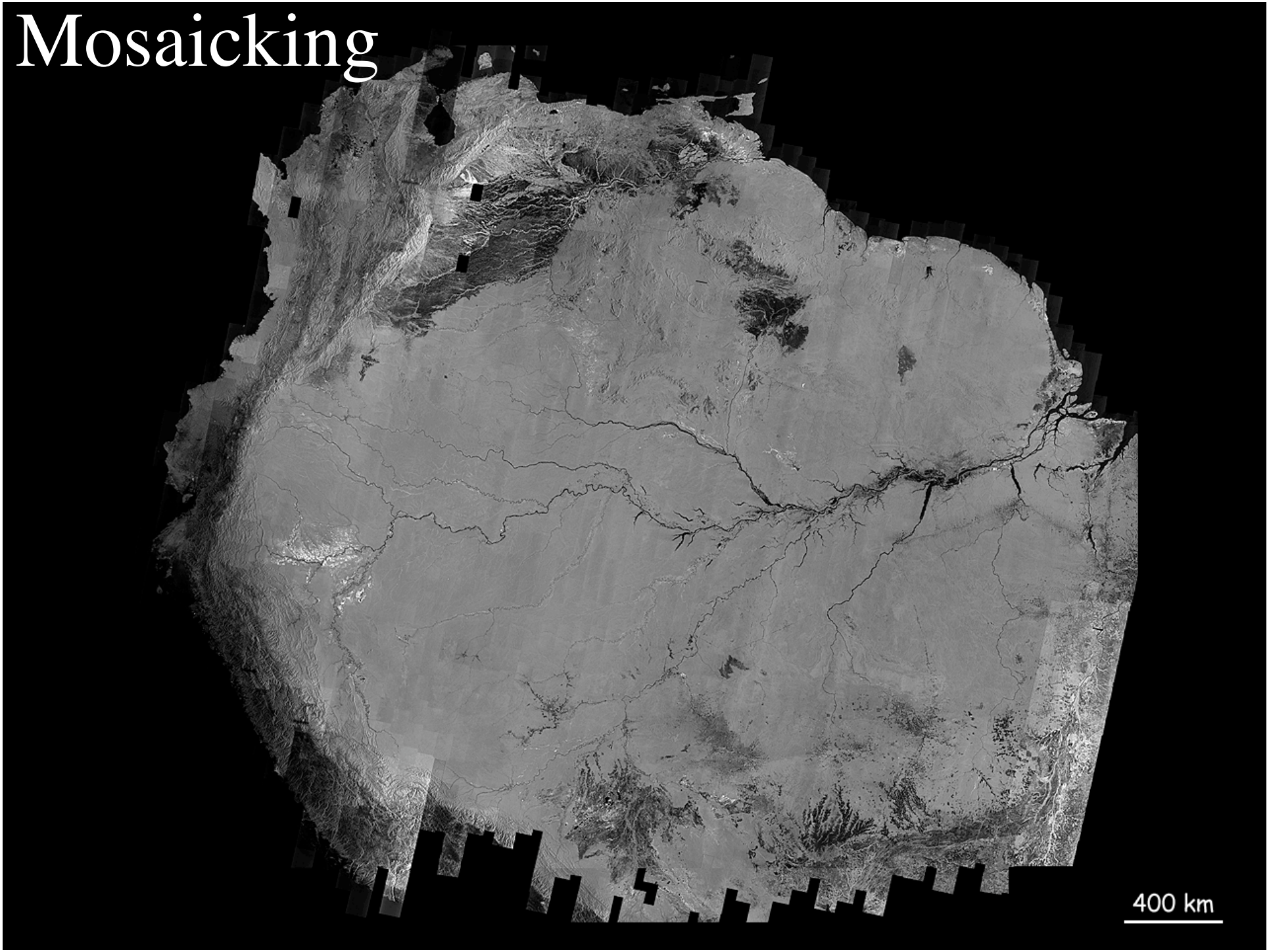
The main objective of this proposed work is to quantify the radar signatures associated with varying standing water and forest canopy/vegetation characteristics.



	habitat				
period	1	2	3	4	5
Low water					
Rising water					
High water					
Rising water					
Low water					

Radar db

Mosaicking



GRFM vs. ALOS KC mosaicking

Images vs. image strips

Disk storage is much less expensive now

Near-global SRTM reference now available

Use SRTM DEM for terrain correction?

Consistent processsing of imagery

Better orbit determination for ALOS

A choice of images to include in mosaic

- Thematic vs. temporal mosaics?

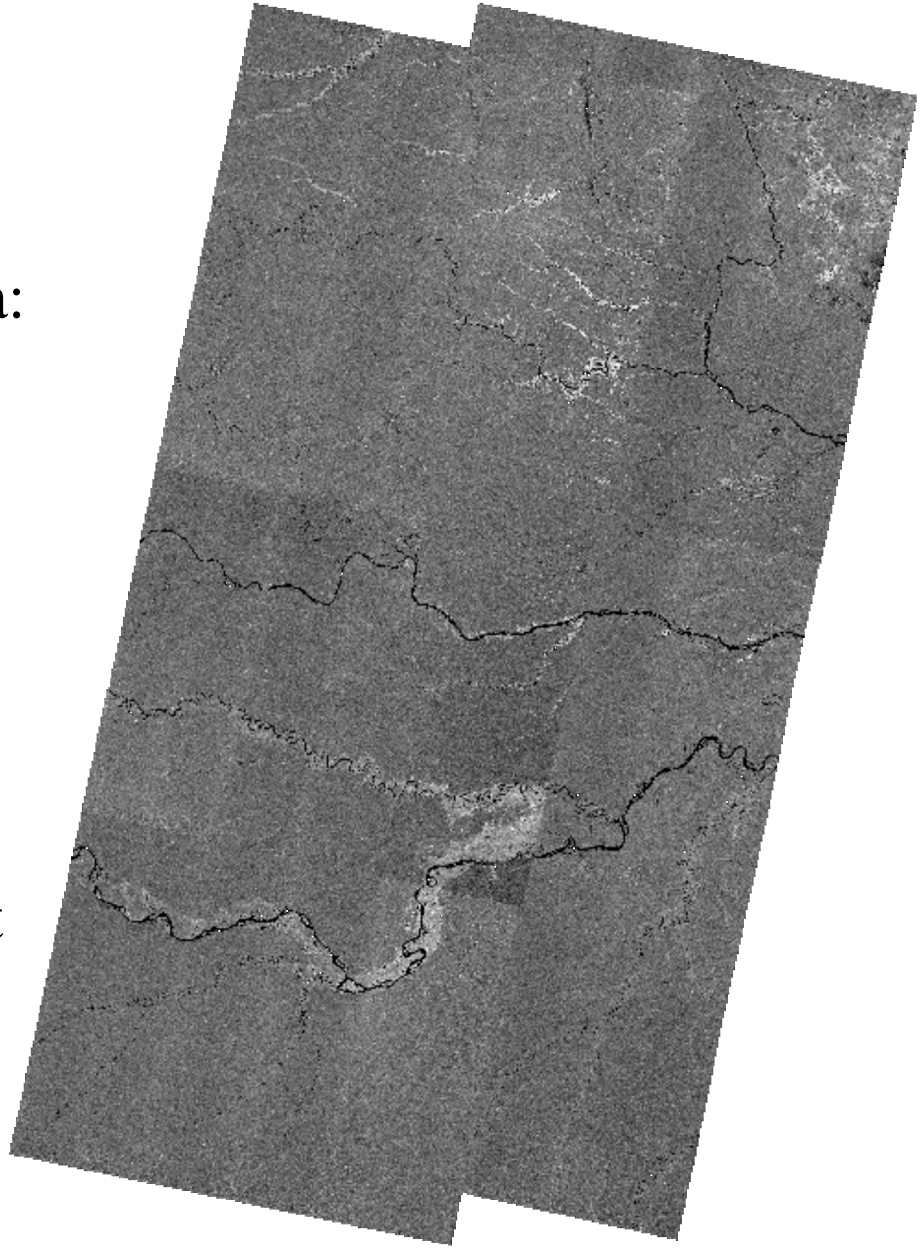
ALOS ScanSAR test mosaic

- Six ScanSAR Scenes
  - Three from May 29, 2006
  - Three from October 6, 2006
  - Western Amazon basin
- 100 m pixel spacing
- To evaluate
  - Calibration
  - Geolocation and projection
- No attempt to correct geolocation or calibration

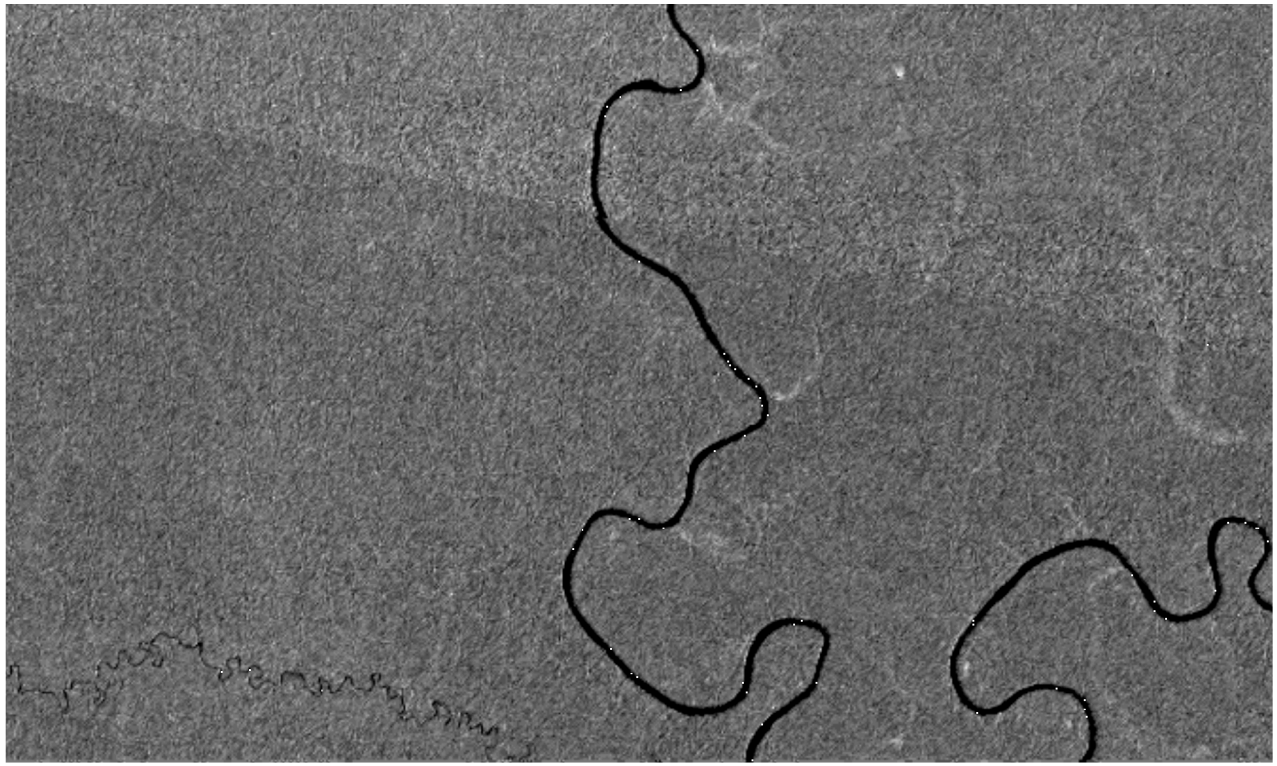
From this small sampling of data:

•Calibration on par with JERS fine resolution data

•Geolocation better by at least a factor of 2

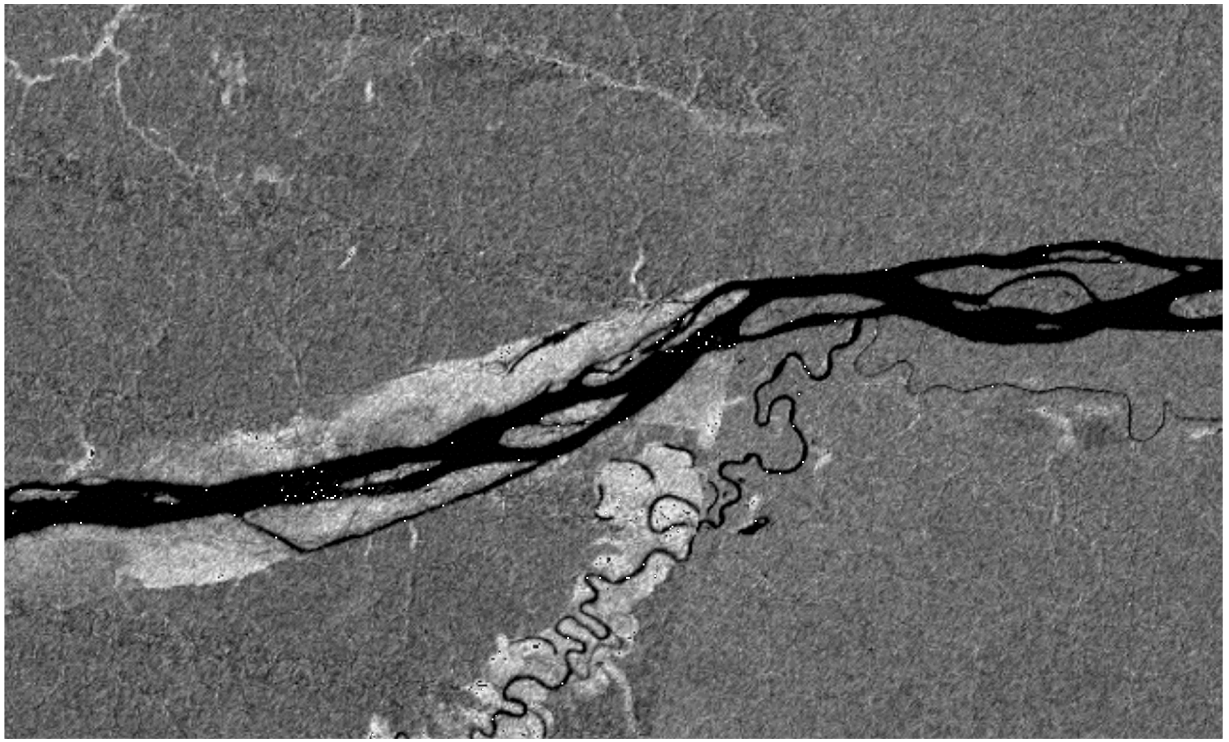


This image decimated for display in ppt



- Matches at pixel level
- Slight calibration offset
- Two scenes from same path

Full Res (100m)



Overlap is between 2 paths

Full Res (100m)

Has technology advances made mosaicking obsolete ?

Why do we make mosaics?

- Large scale features are more evident
  - But - just loading the individual image strips, we can now use Google Earth to enable this visualization of large areas
- To simplify the analysis of continental scale data sets
  - But - we toss out data in the overlap regions
  - But - out of season or other replacement data may be inserted for completeness
- To aggregate a single season of data into a single image
  - But - with ALOS, there will be temporal discontinuities due to gaps in coverage and due to the nature of the 46 day orbit
- To help us derive more accurate geo-location of the imagery
  - But - ALOS PALSAR geo-location appears to be excellent.
- So that users do not have to ‘search’ for their image - they know their site is covered in the mosaic
  - But - again, Google Earth can help us find the image we want

The difficult decisions to be made:

What image strips should be in the mosaics?

What image strip should be 'on top' in the overlap region?

- We are not really getting an instantaneous snapshot
  - Takes 46 days
    - And we don't progress 1 day per orbit westward anymore!
  - There will be occasional gaps
  - During 46 days, there can be significant change
  - We will have a very temporally diverse data set spanning a couple of years
- Scientists may want to combine
  - Ascending and descending data
  - Scansar and fine resolution
  - Data from different years
- What do we do in overlap areas?
  - Throw out data?

On the other hand…

- Most users want a single image containing their entire site
  - In some cases, their site can span quite a large area.
  - Simplifies GIS analysis
- A mosaic can be very informative about large scale features
- A mosaic can help identify systematic calibration issues.
- Endproducts - such as wetland extent or land cover classifications - should be mosaics, as these are intended for a different set of users

But - I think most users would like to choose exactly what goes into a mosaic

Mosaicking on the fly?

- Let the user choose what to mosaic!
  - Subsample the data into manageable segments
    - Small enough to easily ftp
  - Use an easily understood and easily mosaicked projection
    - Equiangular Lat/Lon
      - Might have to vary pixel spacing as you move north
      - Goes right into Google Earth
  - Each tile is a unique time and place
    - Don't have to worry about out of season data in a mosaic
    - overlap regions preserved
  - Tiles need to be assembled
  - Typically, two partial tiles will have to be merged on occasion to have a gap-free mosaic. But these tiles can be merged at the users discretion.
- Geolocation and calibration accuracy key to success
  - This is the case regardless

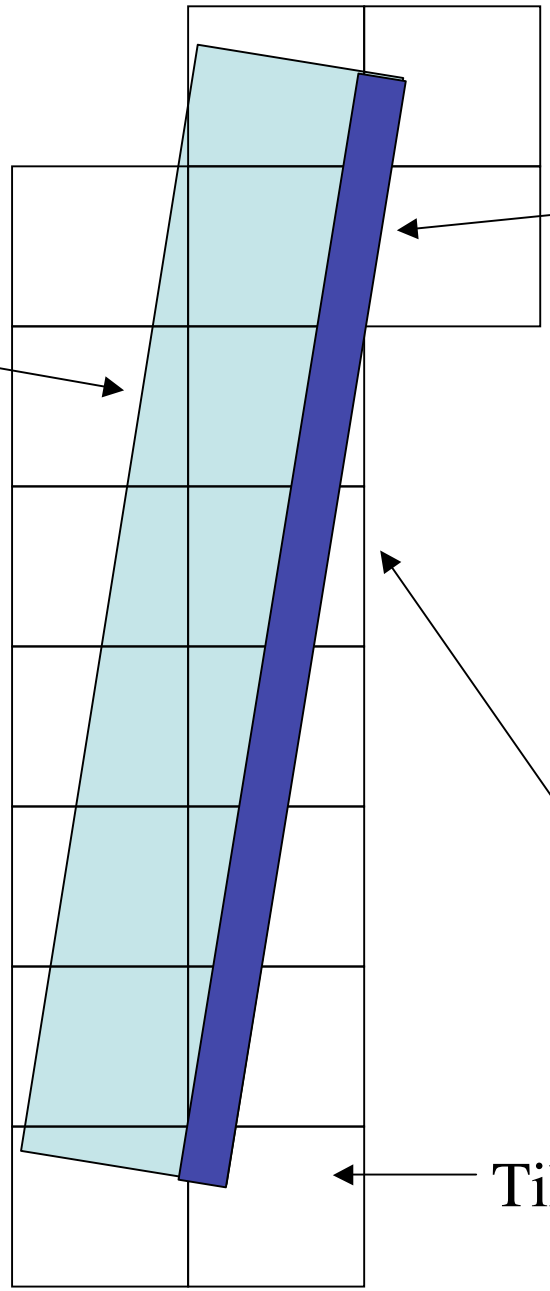


Image strip

Area otherwise thrown out as 'overlap'

For example:

- 3 arcseconds per pixel
- 1x1 degree tiles
- same as SRTM

Zero-fill becomes transparent in GE

Tiles

On occasion, these partial tiles will need to be merged with other partial tiles.

Mosaicking on the Fly?

- Online tool to mosaic what you want
  - Website/GE combination of resources
  - Maybe users don't do any mosaicking
    - But they find the exact areas that they want and no more
  - If mosaicking is desired- the USER CHOOSES WHAT IMAGES TO INCLUDE
- Option to reproject mosaic to UTM

Mosaicking on the fly?

- Thematic mosaicking
  - i.e. Maximum wetland extent over 2 years
- Fine tuning of seasonal coverage (modulo 46 days)
- Mode combinations depending on scientific need
  - Fine resolution and scanSAR
  - Ascending and Descending

Something to think about…