

# Hurricane-Induced Storm Surge on Lake Okeechobee



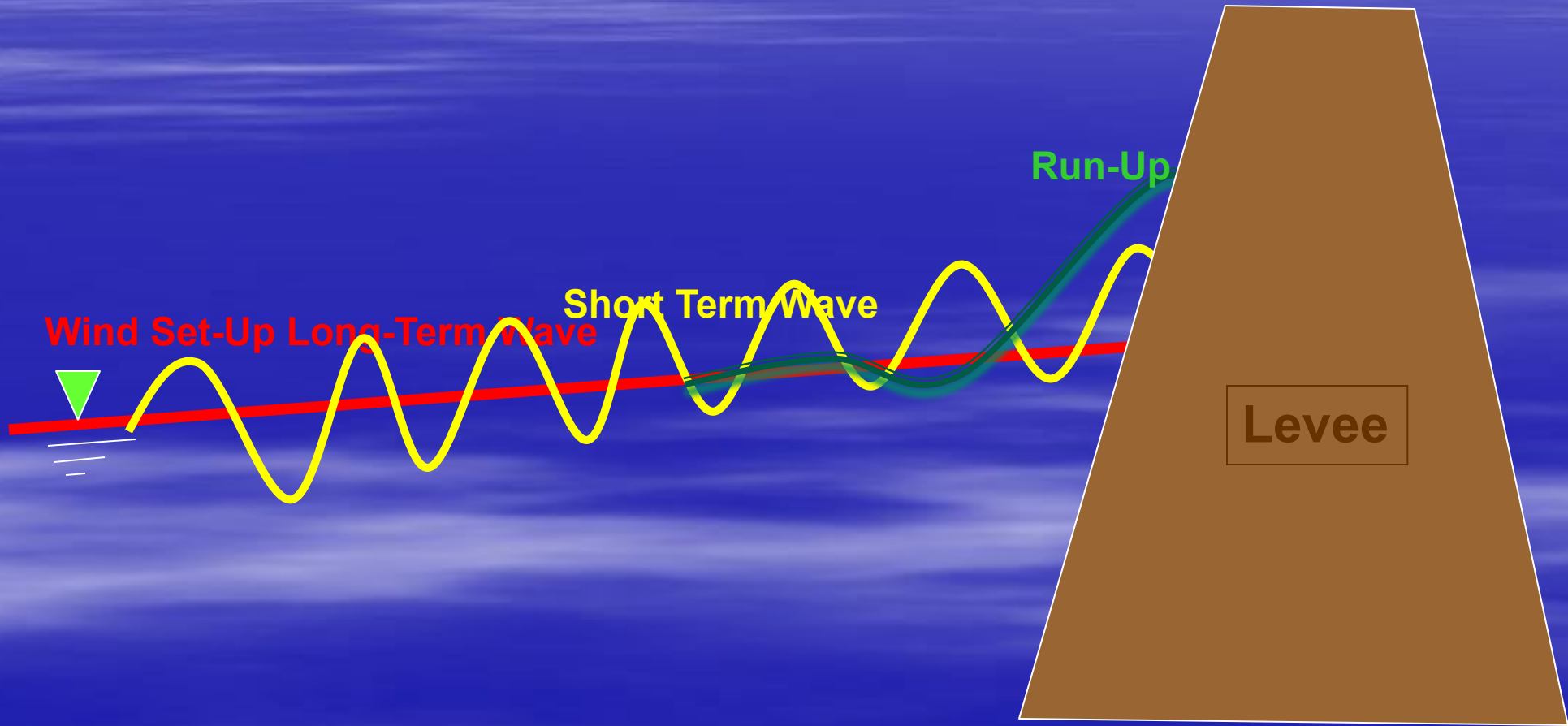
**KR JIN, PhD**



**WIND**



WIND



# Storm Surge


=

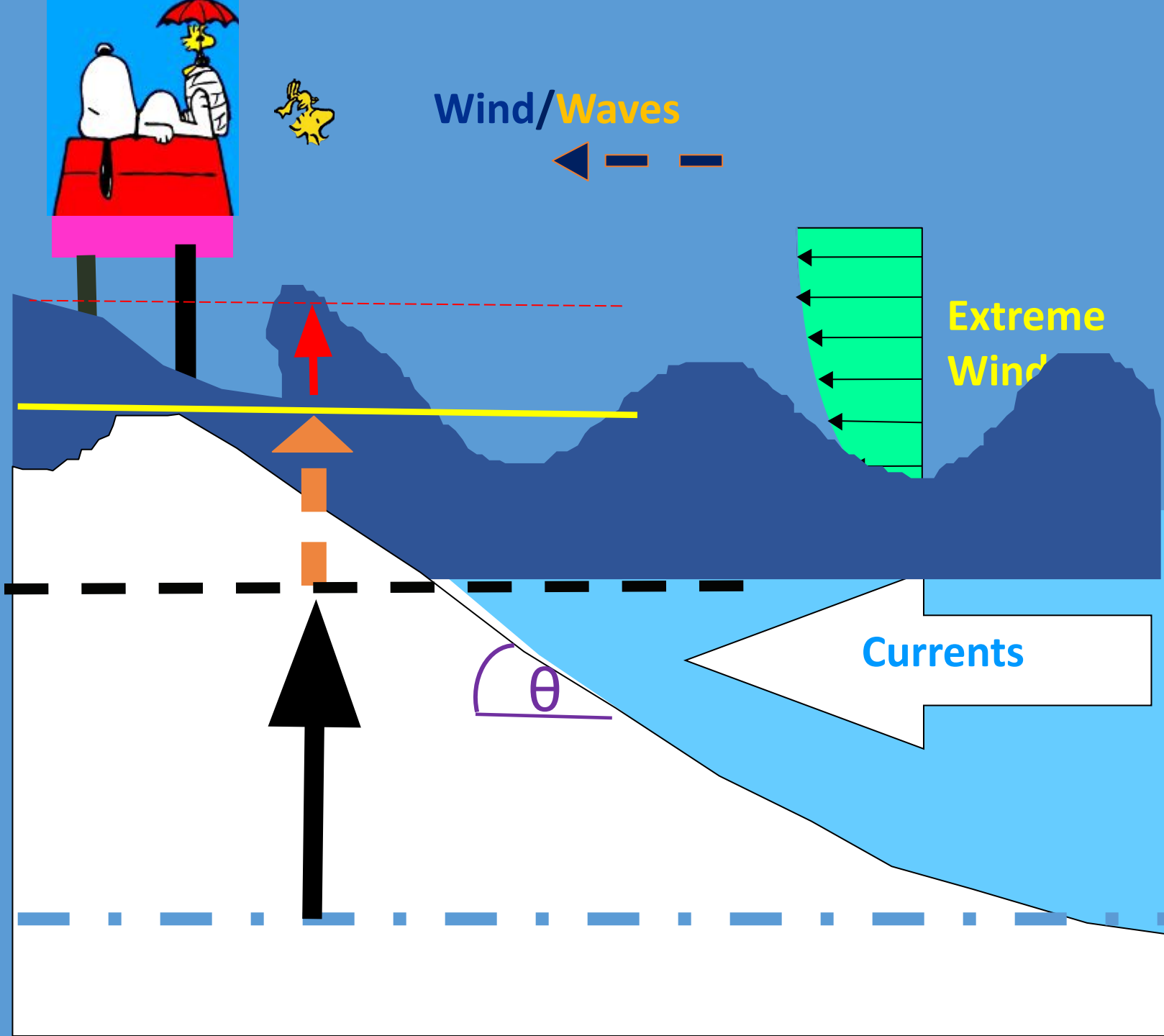
 Wave Runup

+

 WIND Set-Up

+

 WATER DEPTH



# HURRICANE CATEGORY

- **Category 1 Sustained winds 74-95 mph**
- **Category 2 Sustained winds 96 to 110 mph**
- **Category 3 Sustained winds 111-130 mph (178-208 kph)**
- **Category 4 Sustained winds 131 to 155 mph**
- **Category 5 Sustained winds over 155 mph**

# IRMA TRACK HISTORY

SEP. 9-11, 2017

DEPRESSION T.S. HURRICANE CAT. 3+

ALTERNATE TRACK B:  
OFF GULF COAST

ALTERNATE TRACK A:  
ATLANTIC COAST

ACTUAL  
TRACK

Radius 400-420 mile

The  
Weather  
Channel



# IRMA RADAR/TRACK HISTORY

September 10, 2017

DEPRESSION T.S. HURRICANE CAT. 3+

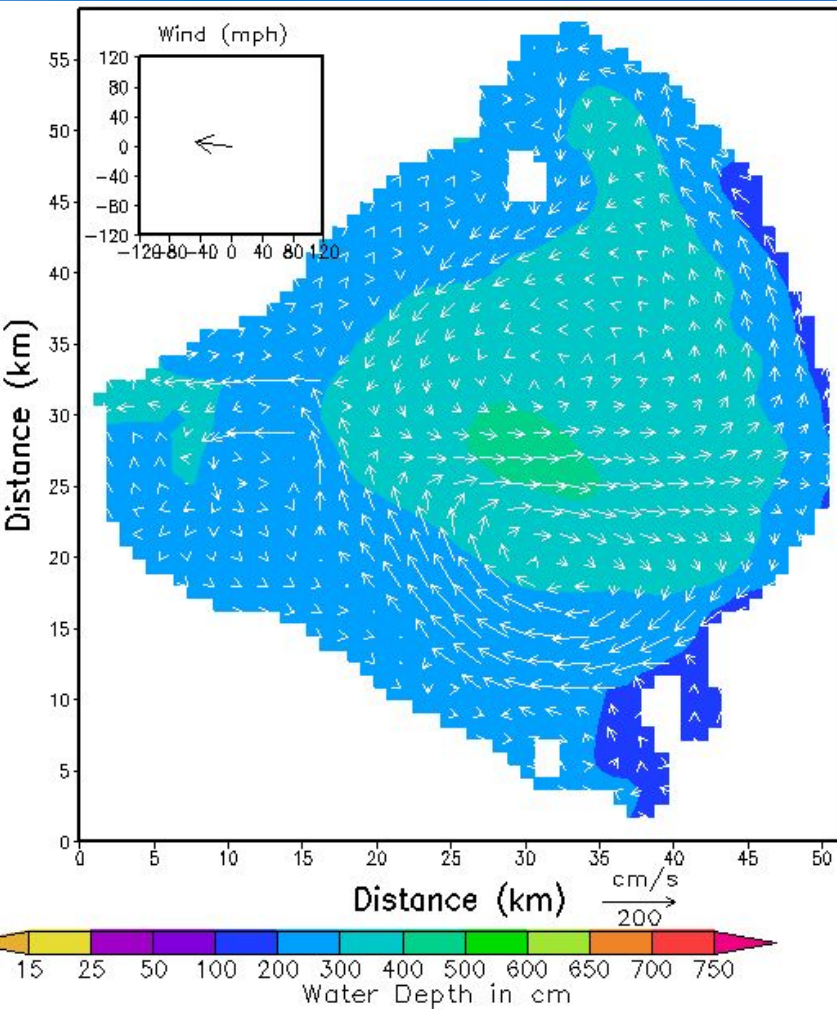


The Weather Channel

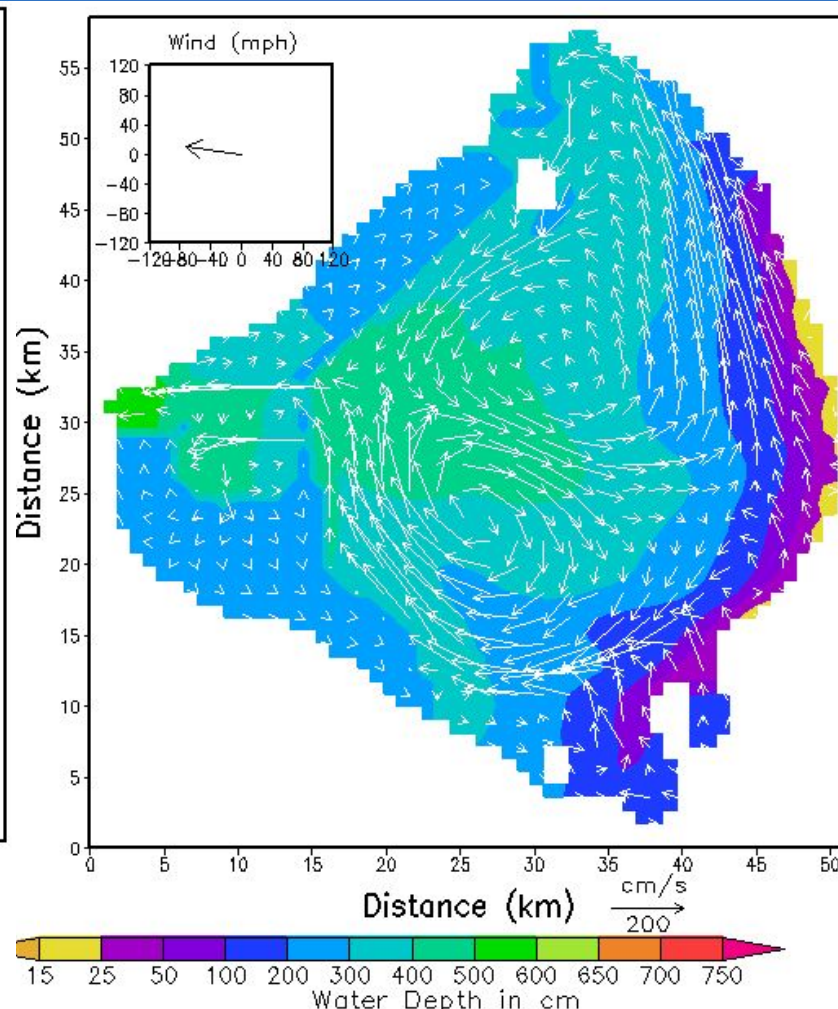
4:00PM, 9/10/2017.

Bench = 63mph; Case I = Bench \* 1.58 = 100mph; Case II = Bench \* 1.9 = 120mph

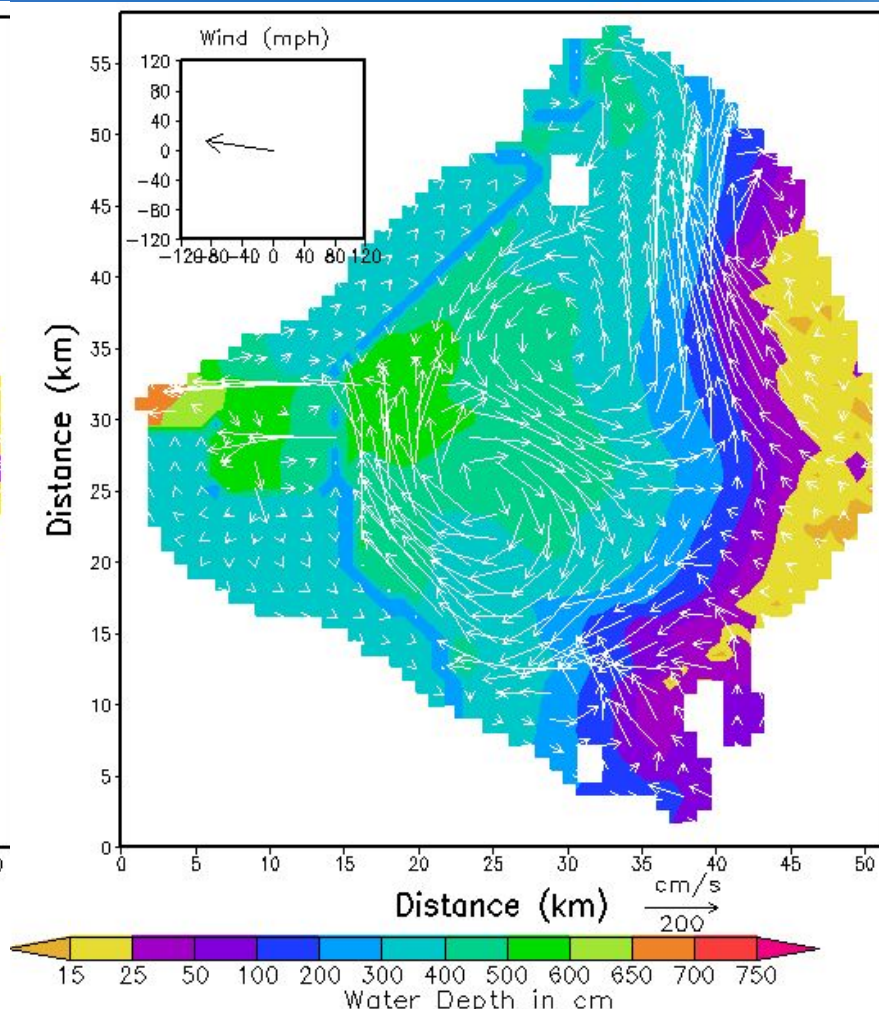
Bench



Case I-Cat II



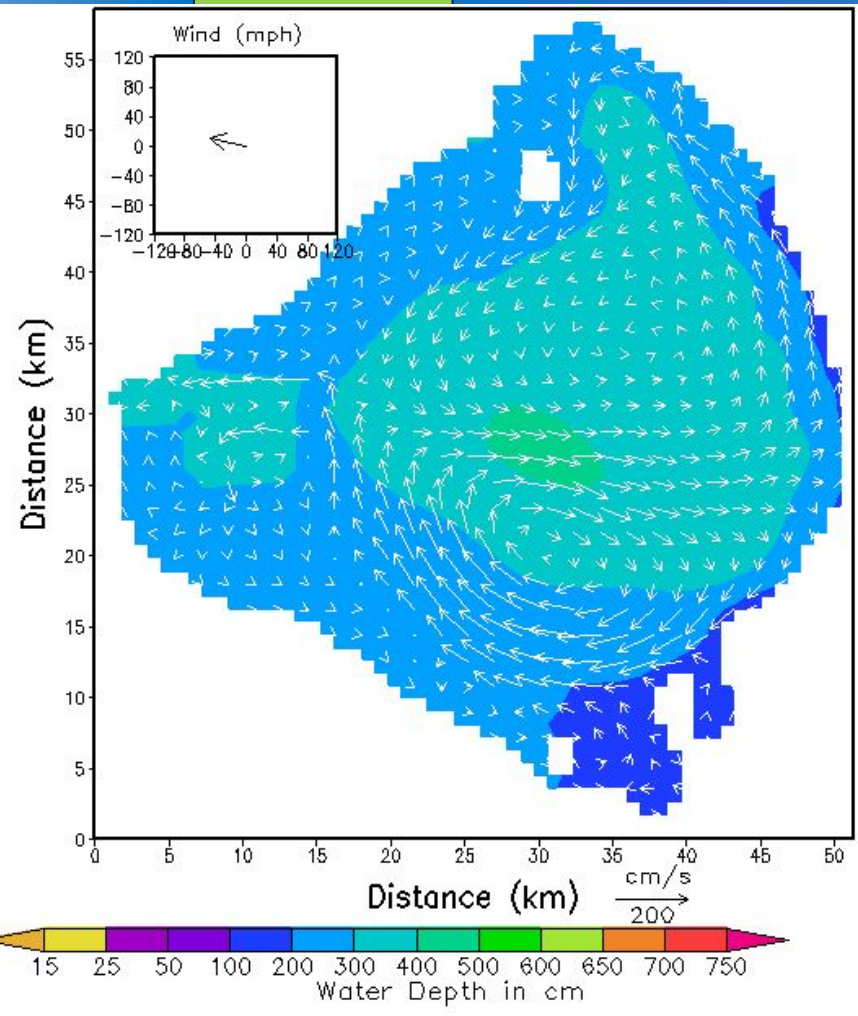
Case II-Cat III



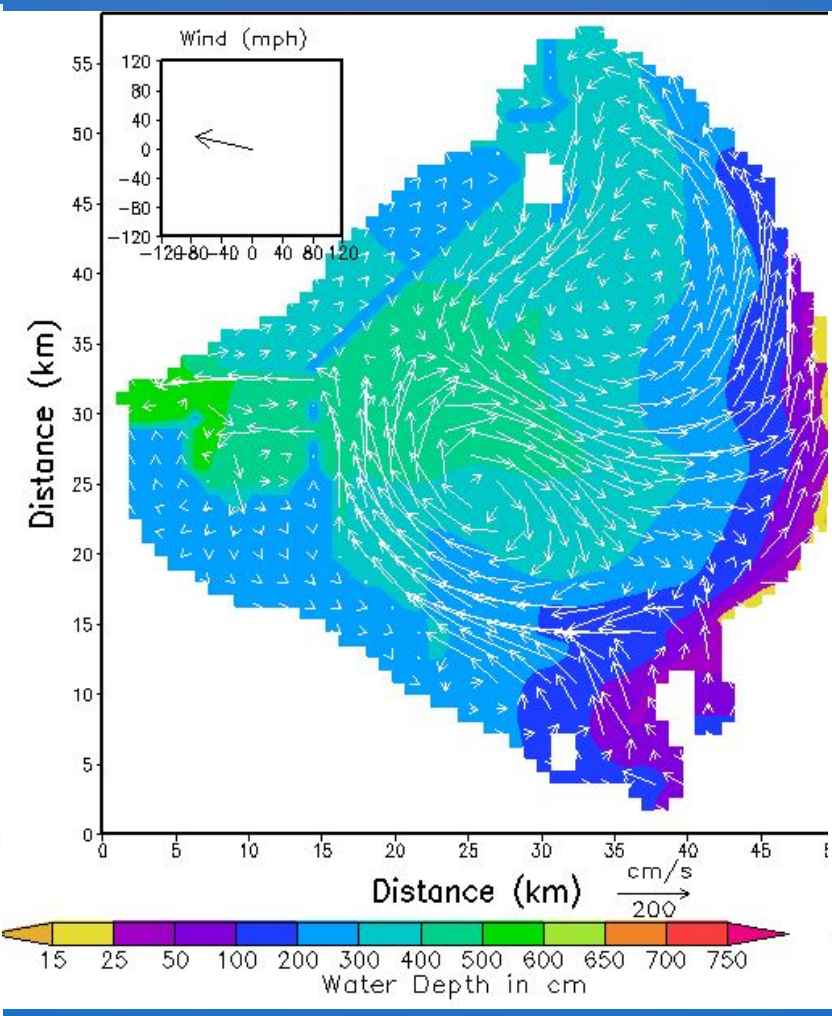


5:00PM, 9/10/2017.

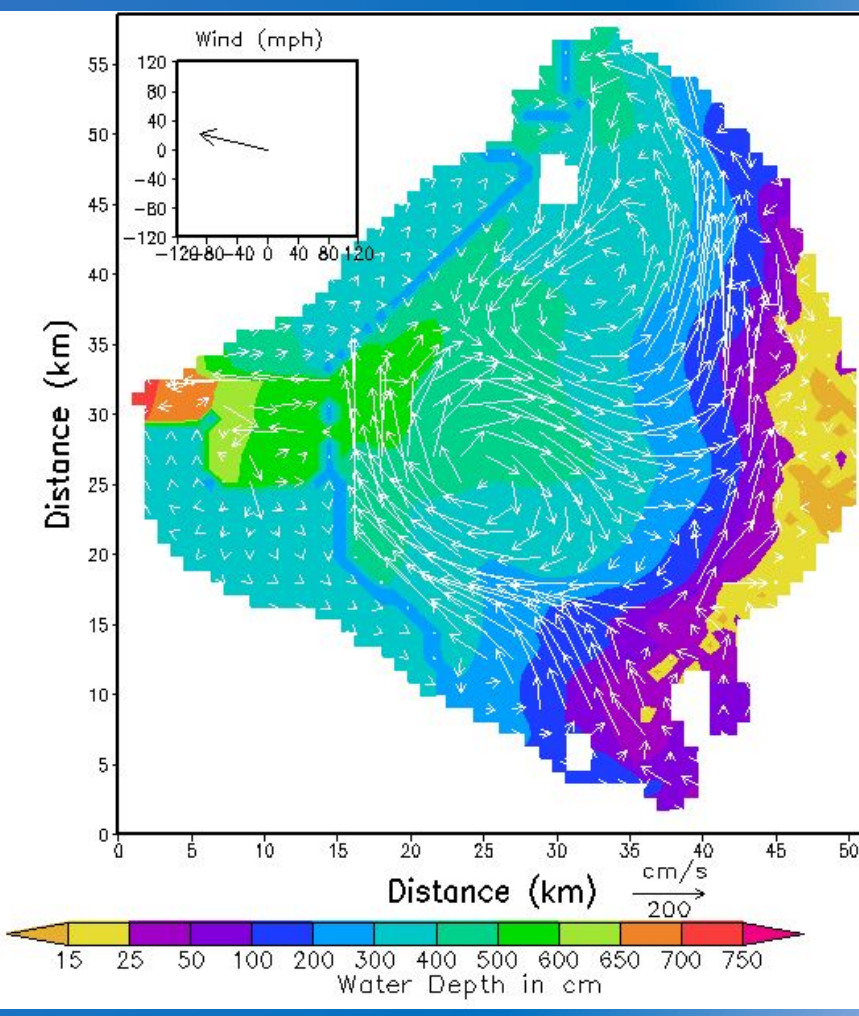
**Bench**



**Case I-Cat II**

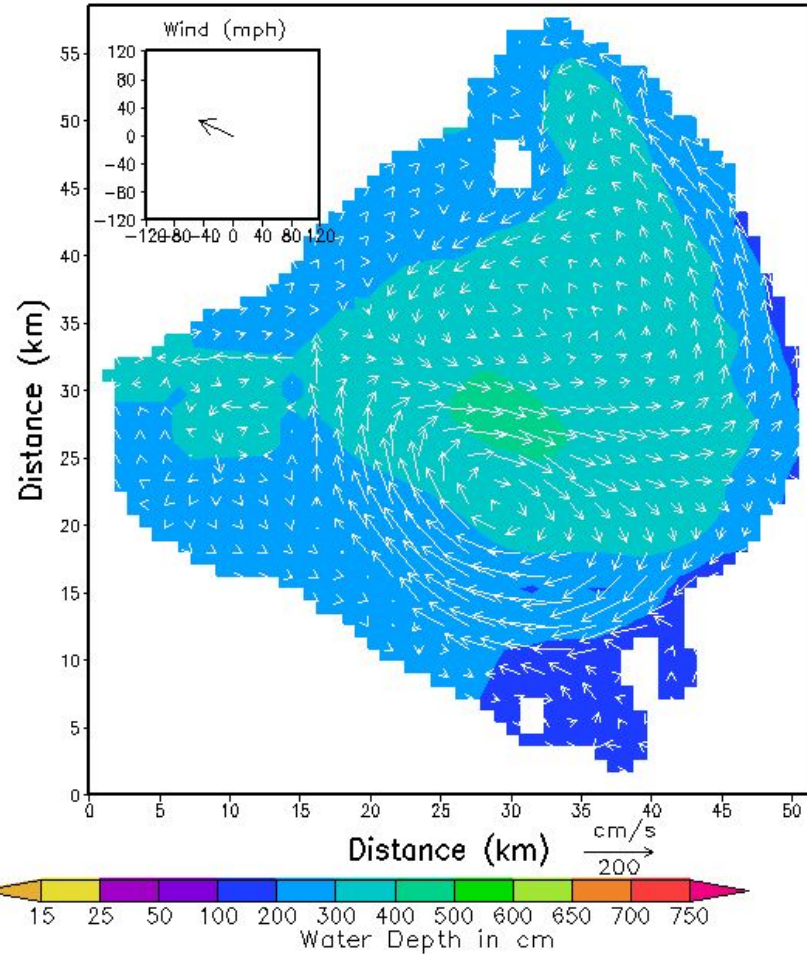


**Case II-Cat III**

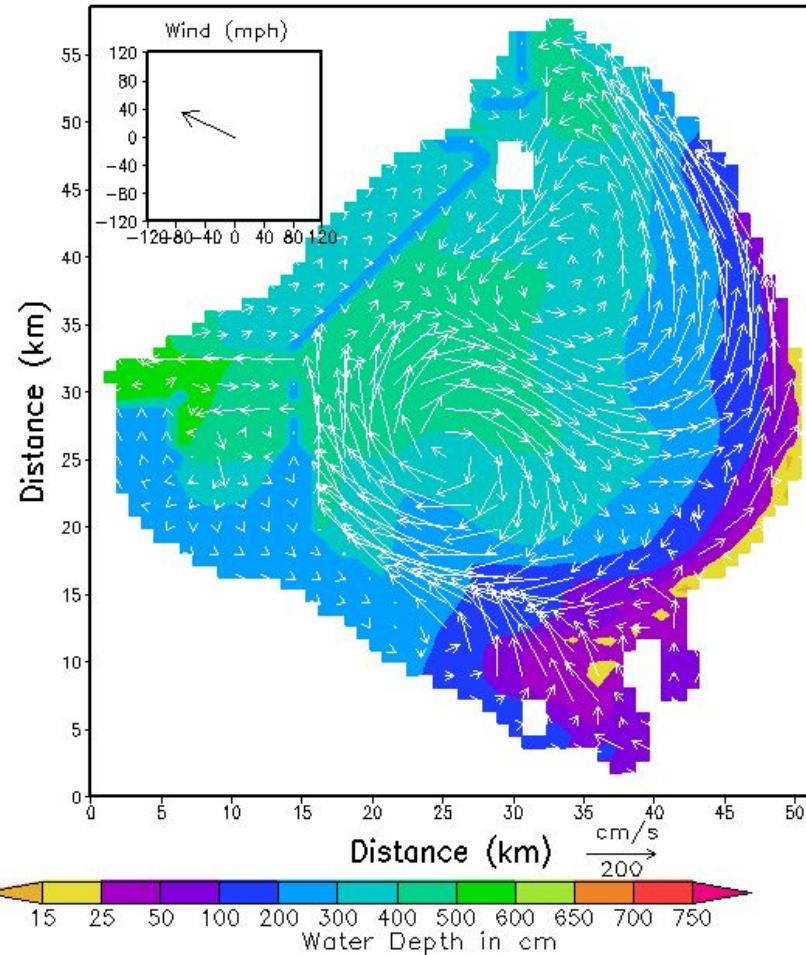


6:00PM, 9/10/2017

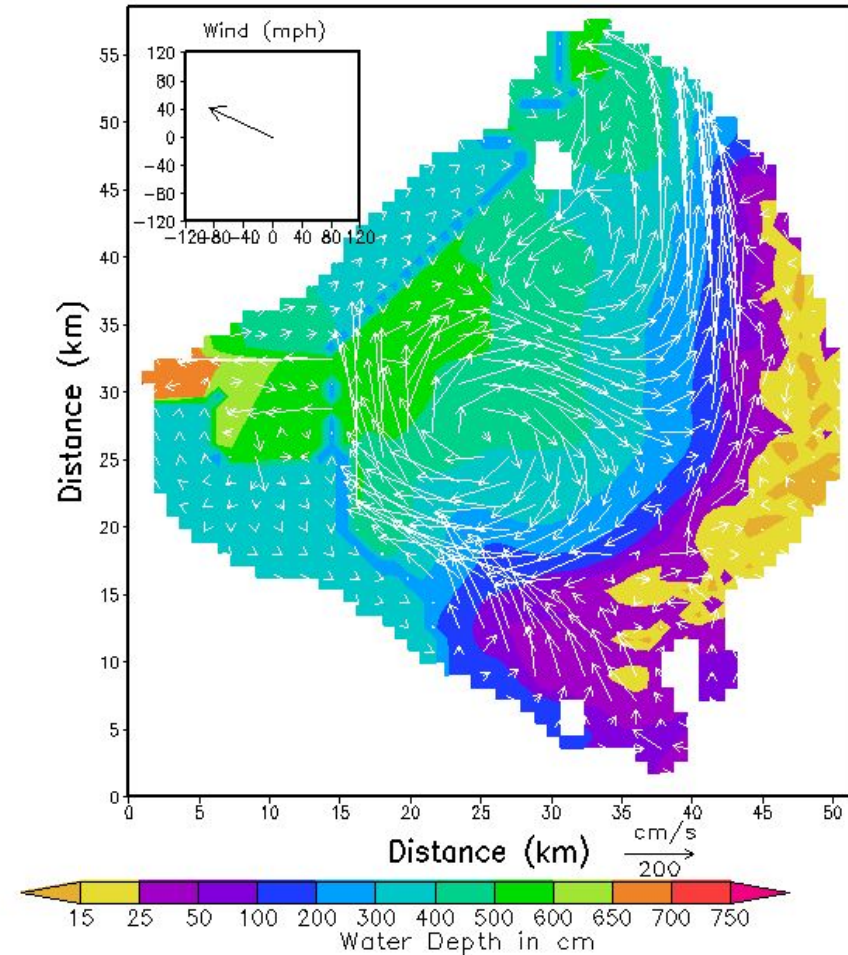
Bench



Case I-Cat II

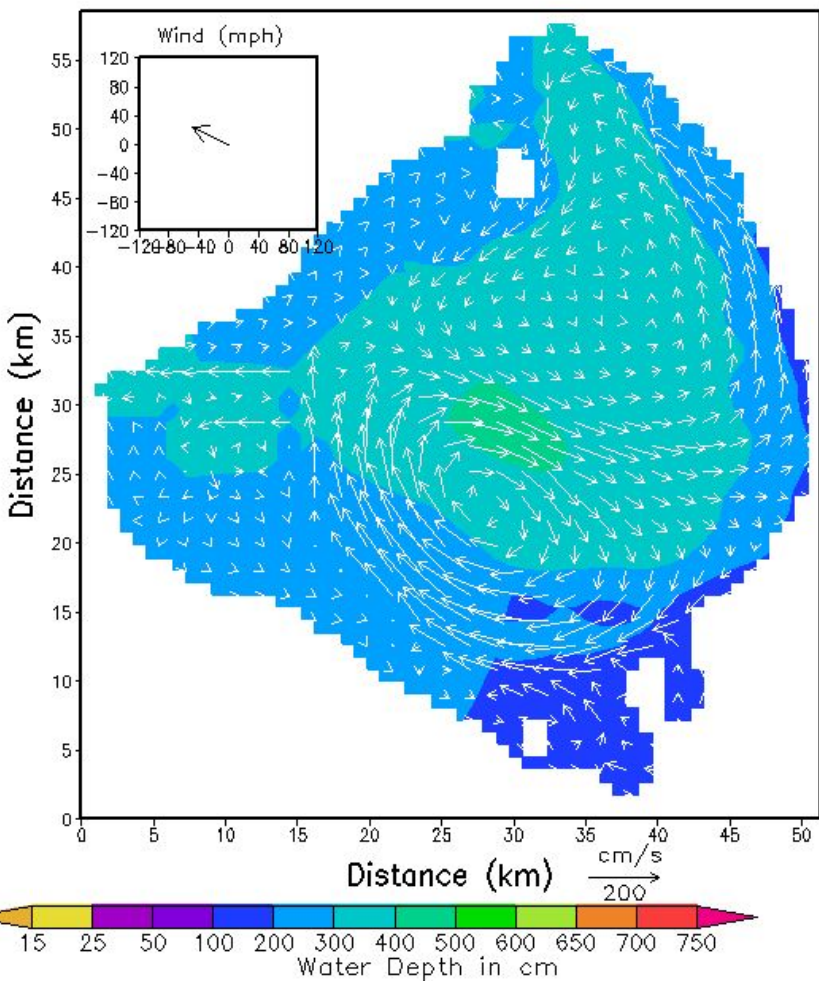


Case II-Cat III

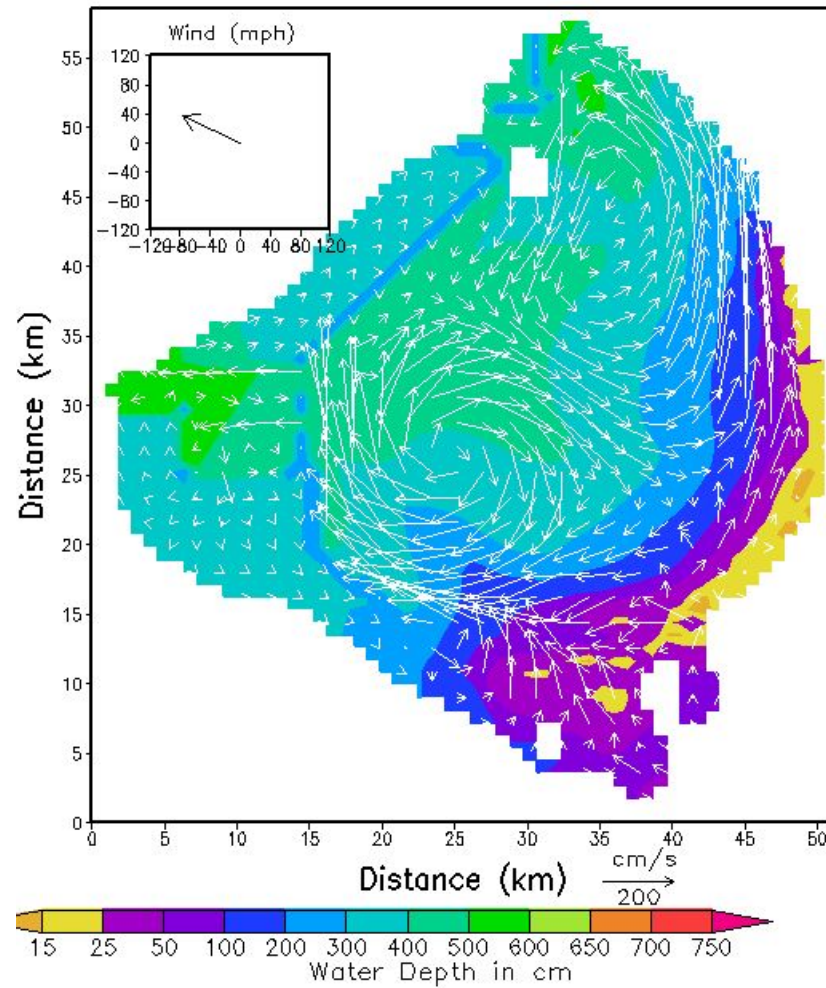


7:00PM, 9/10/2017

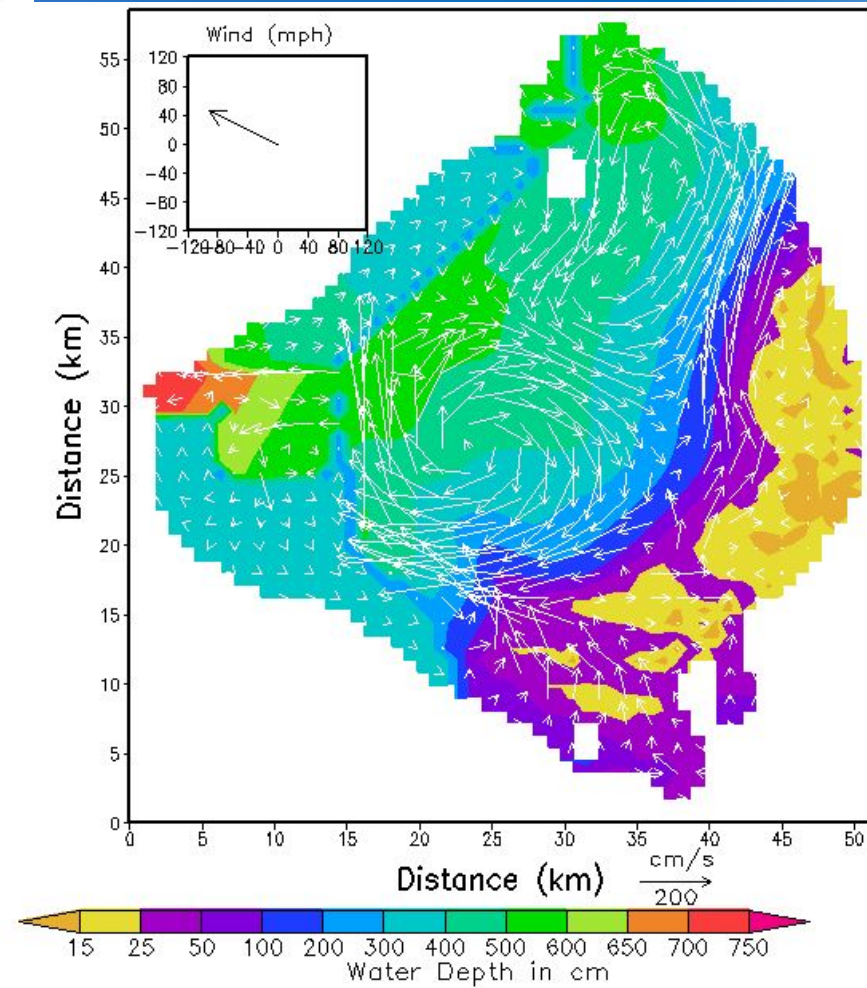
Bench



Case I-Cat II



Case II-Cat III

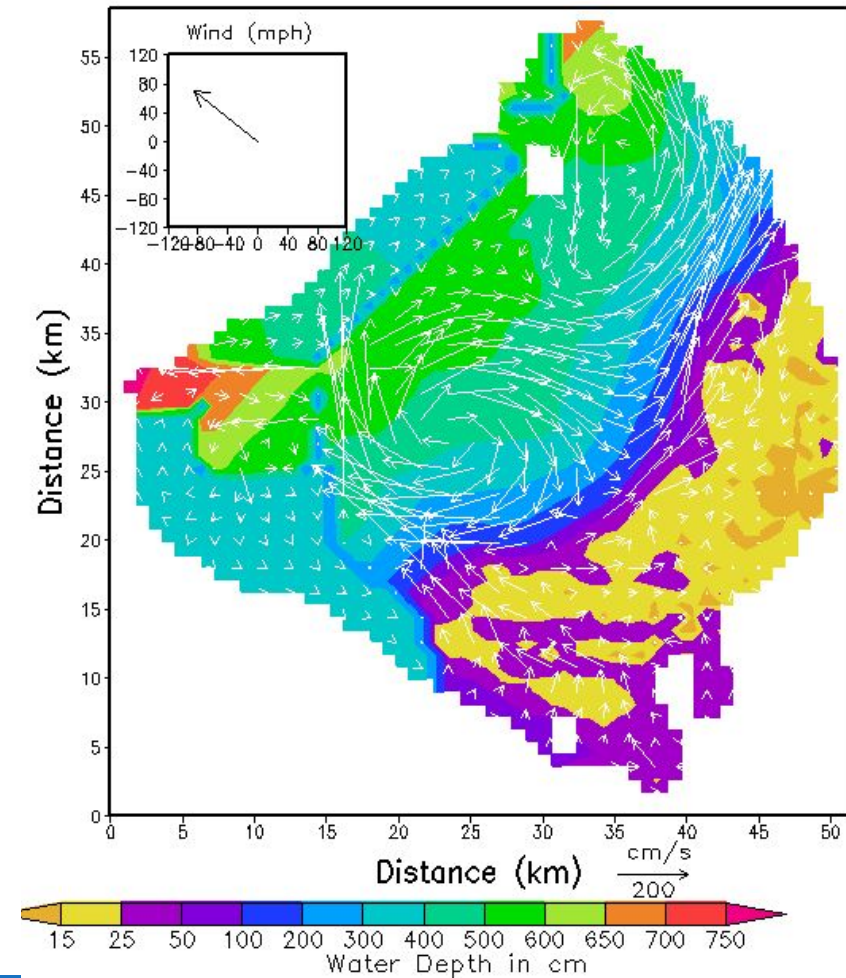
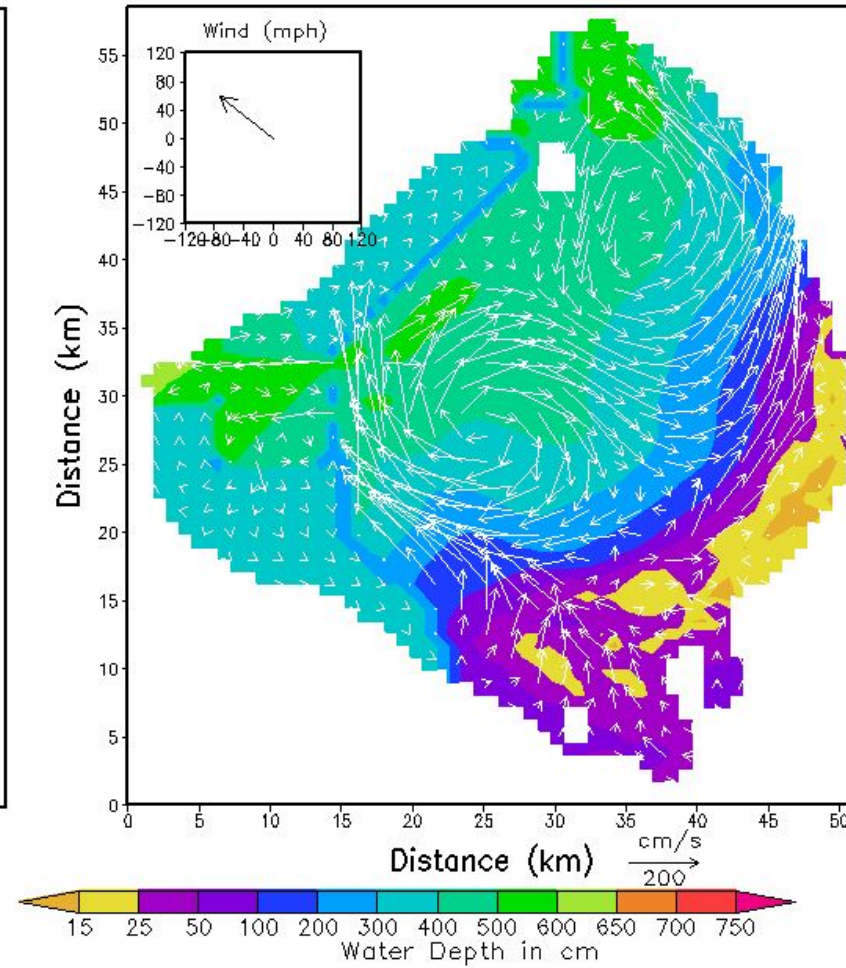
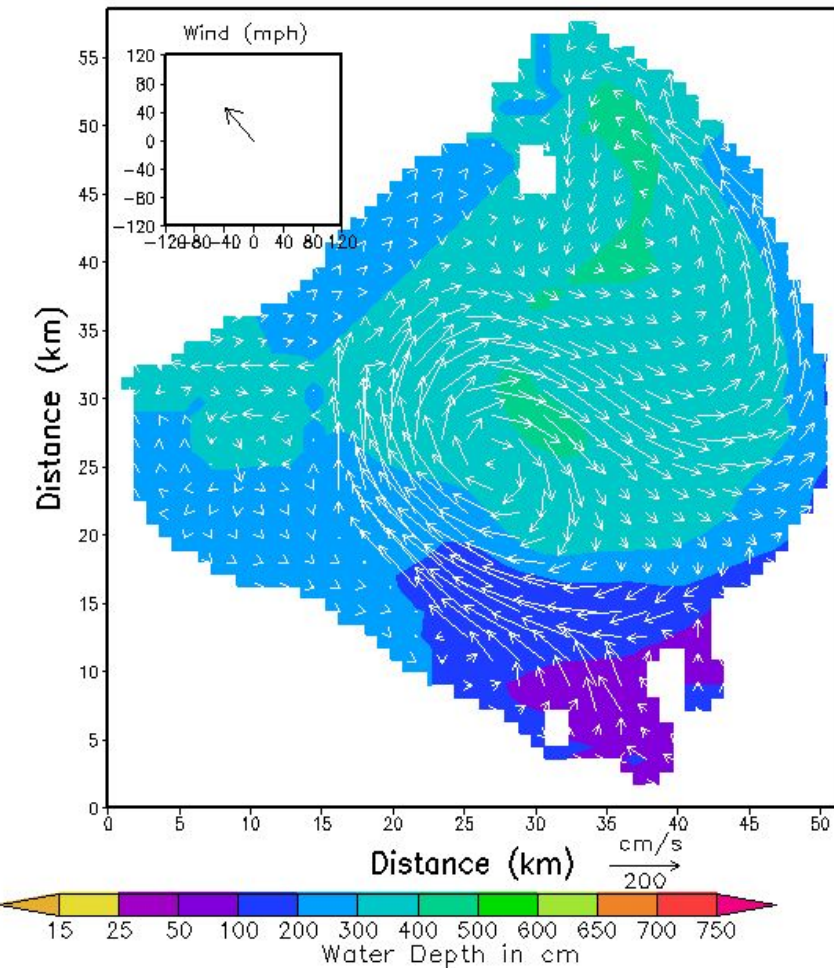


8:00PM, 9/10/2017

Bench

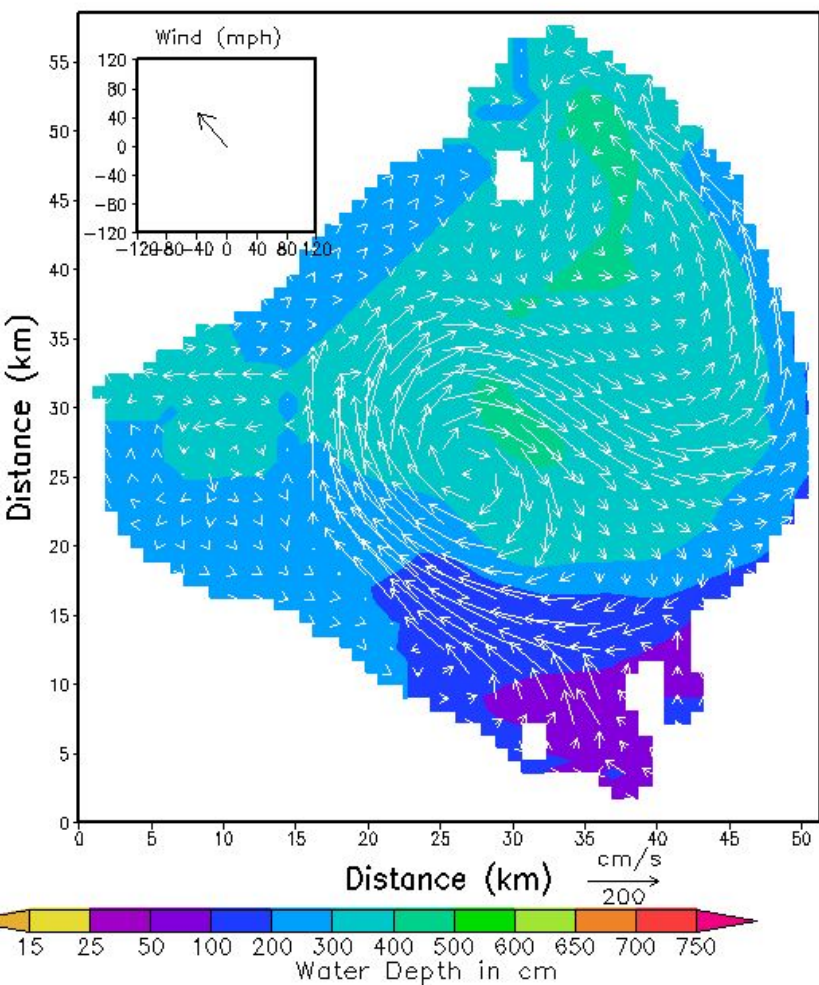
Case I-Cat II

Case II-Cat III

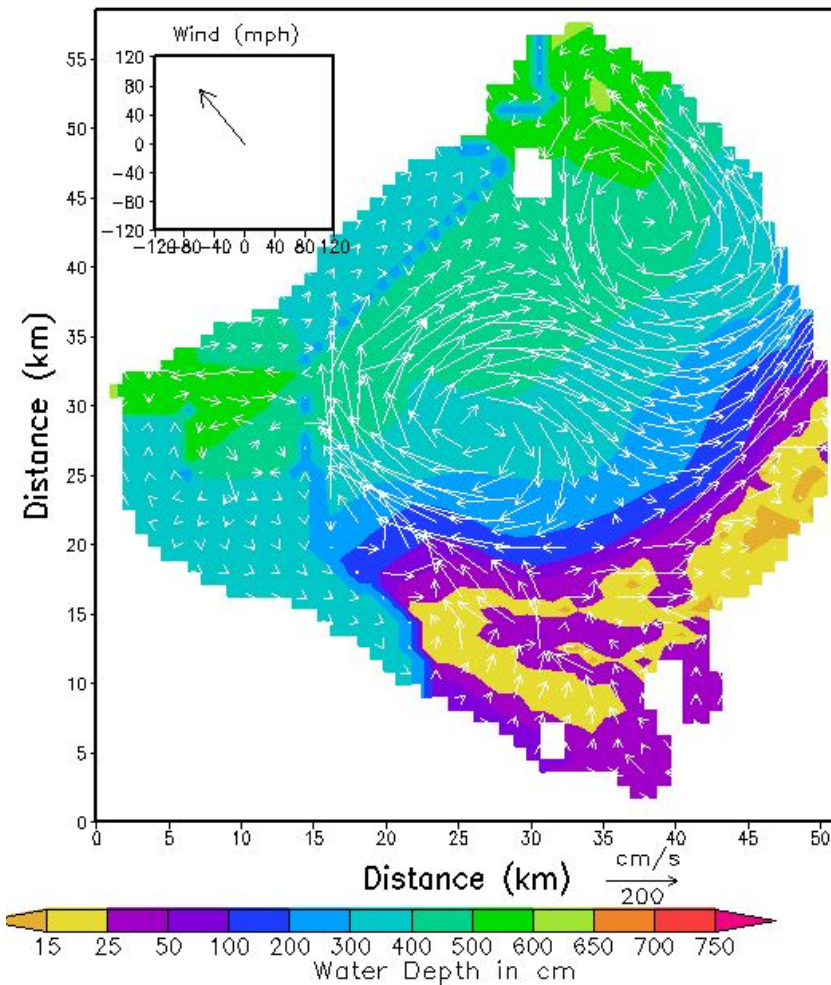


9:00PM, 9/10/2017

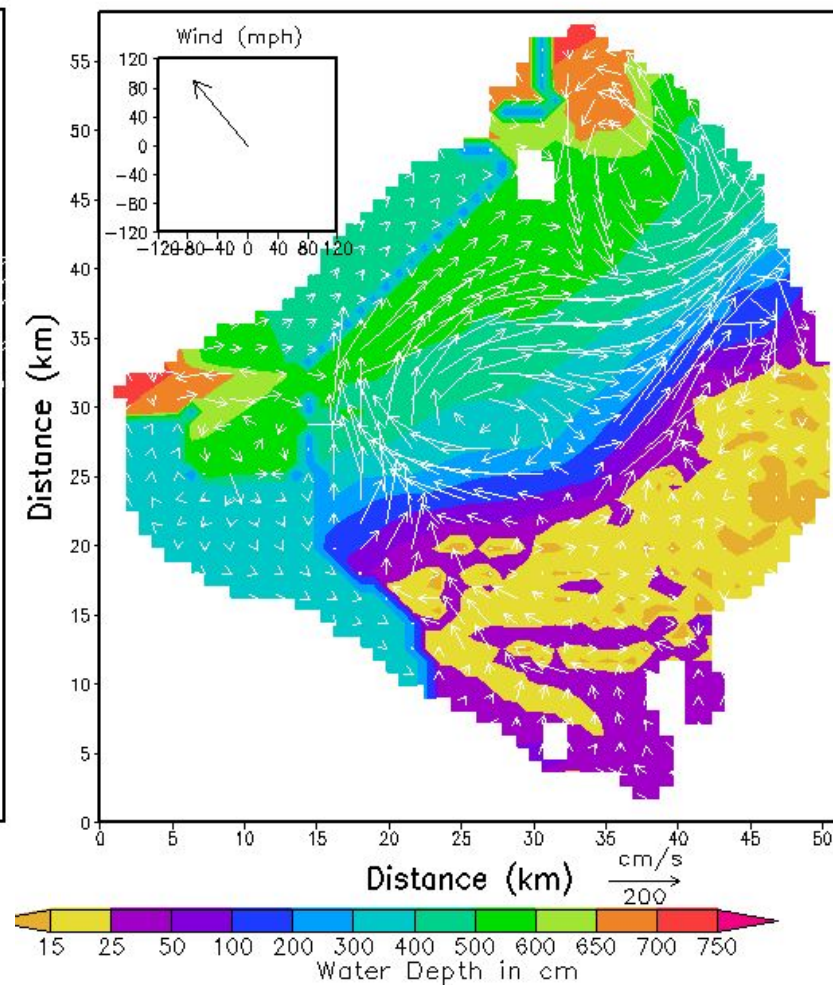
### Bench



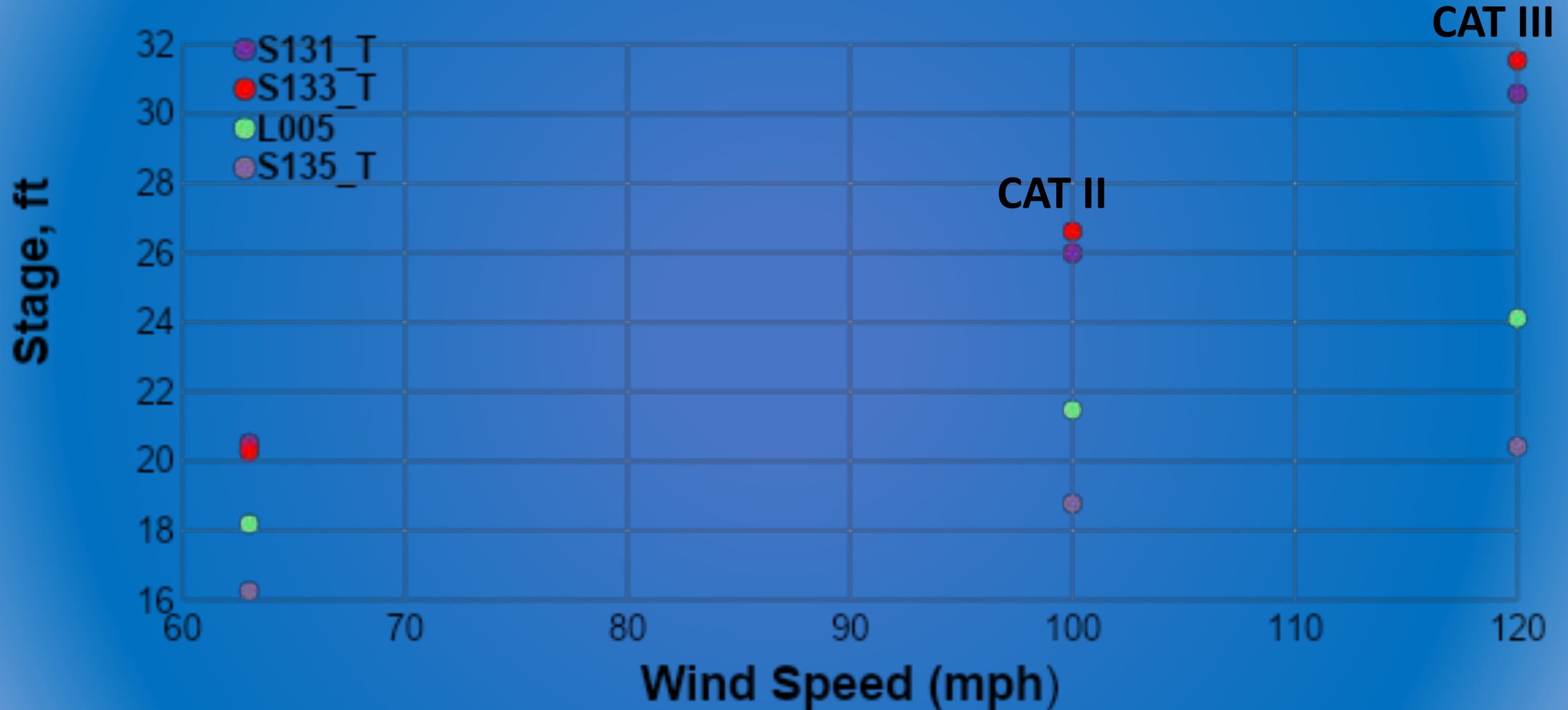
### Case I-Cat II



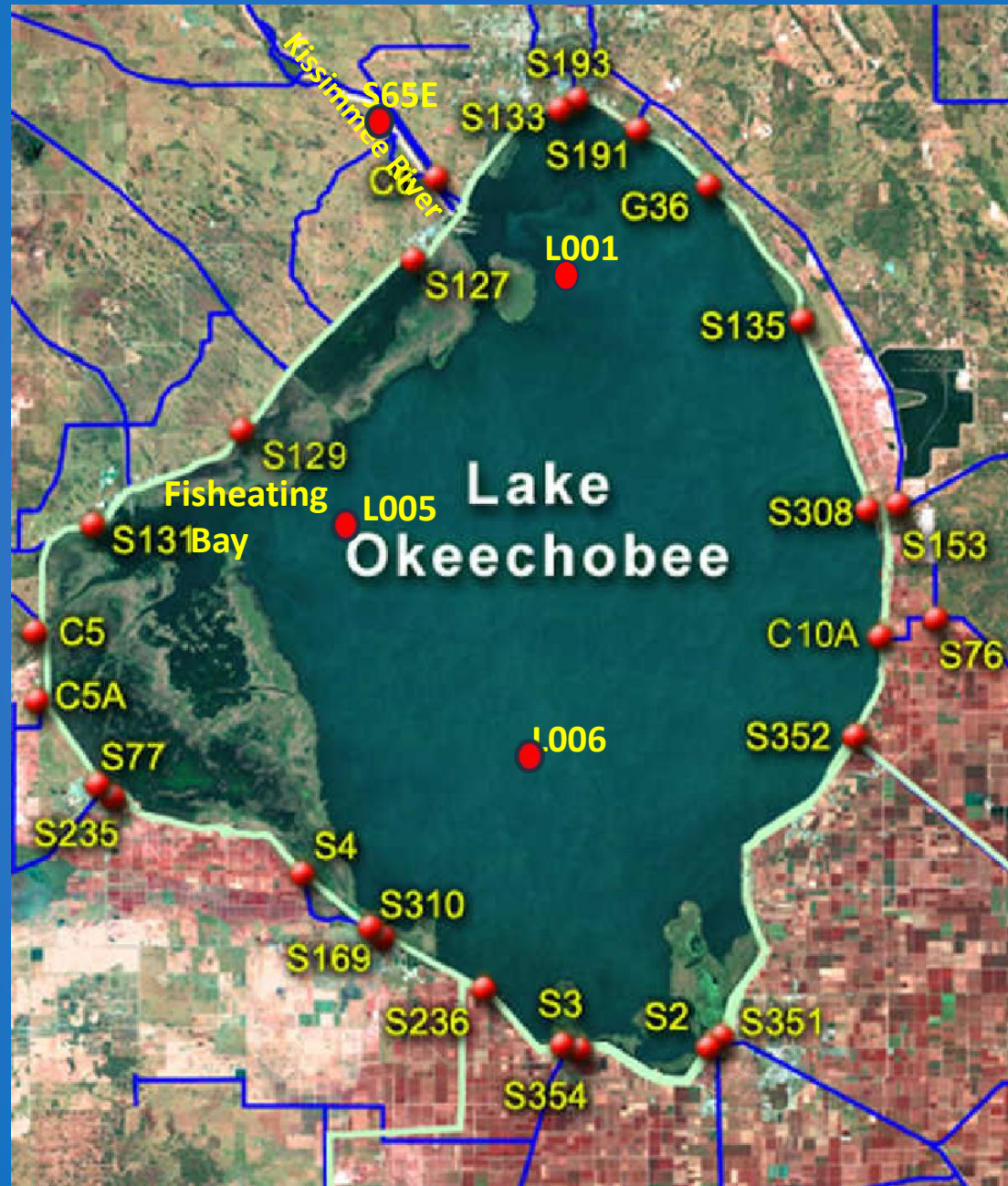
### Case II-Cat III



# Stage/Wind Speed under Hurricane Irma



Normal Condition stage 13 ft

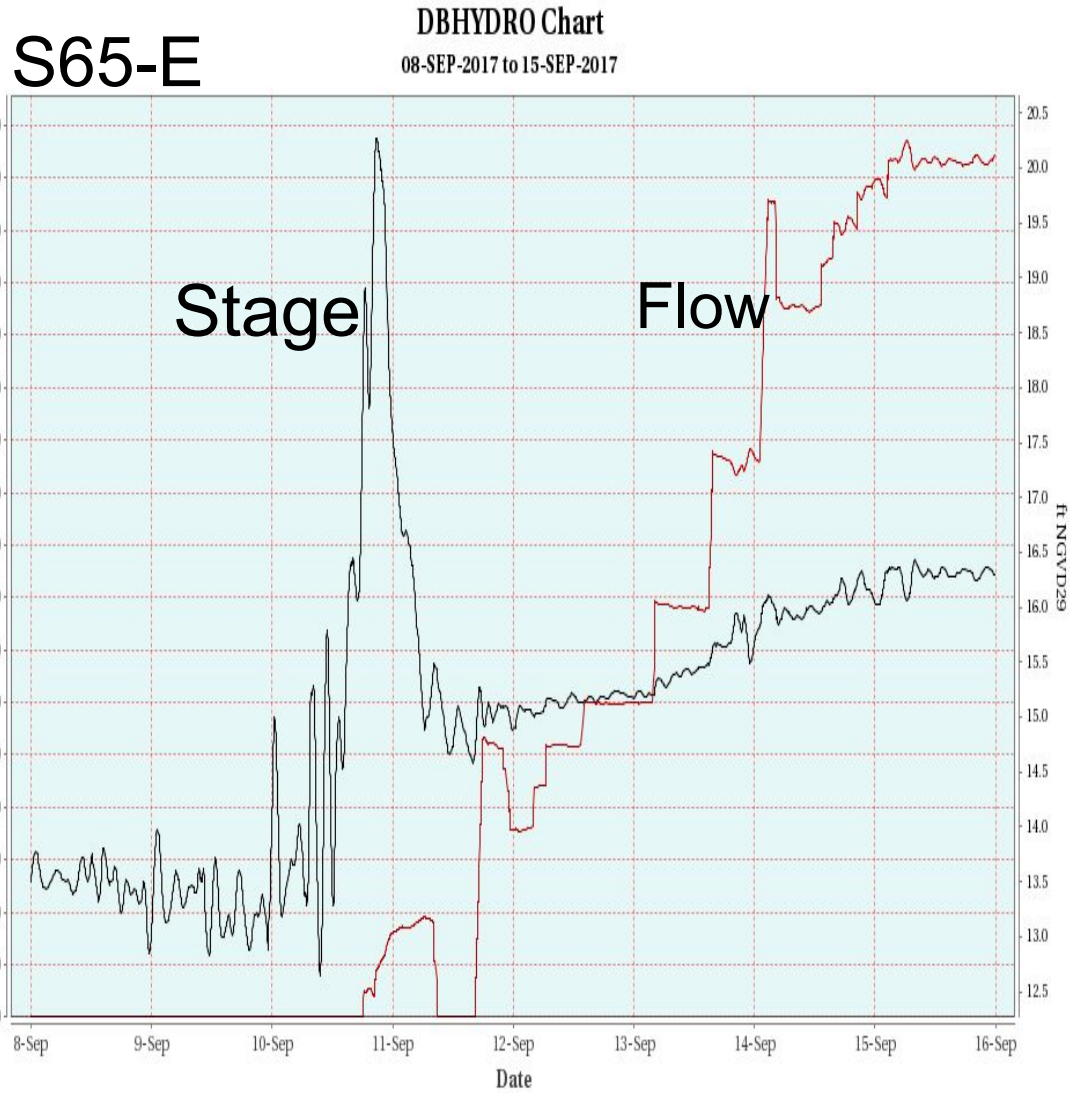


# Velocity Current /Wind Speed

Wind Speed	63 mph			100mph			120mph		
Current Velocity	u	v	V (cm/s)	u	v	V (cm/s)	u	v	V (cm/s)
S352_H	25.24	23.49	34.48	44.07	-37.67	57.98	80.92	48.42	94.30
S135_T	7.56	74.01	74.40	83.05	90.52	122.85	134.00	160.05	208.74
S131_T	22.96	25.18	34.08	32.63	32.98	46.39	34.89	33.54	48.40
S133_T	8.38	14.49	16.74	7.03	22.45	23.52	8.74	27.71	29.06
S308_H	22.19	103.10	105.46	22.19	106.30	108.59	80.92	107.72	134.73



# Hurricane-induced Lake storm surge/erosion in inflow canals





## Current Erosion WILMA 2005

# SUMMARY

(1) Storm Surge Significant -NW/N/NE side of Lake Okeechobee

Normal Condition	Hurricane Irma (63mph)	Cat II (100mph)	Cat III (120mph)
13 ft	20 ft	26 ft	31 ft

(1) Significant erosion along the lake due to the circulation pattern, current velocity ~ 1m/s (**2 m/s**) from S308 to S135

(2) Calibrated/Verified LOEM RMSE/VAR < 3% (12 Sites)