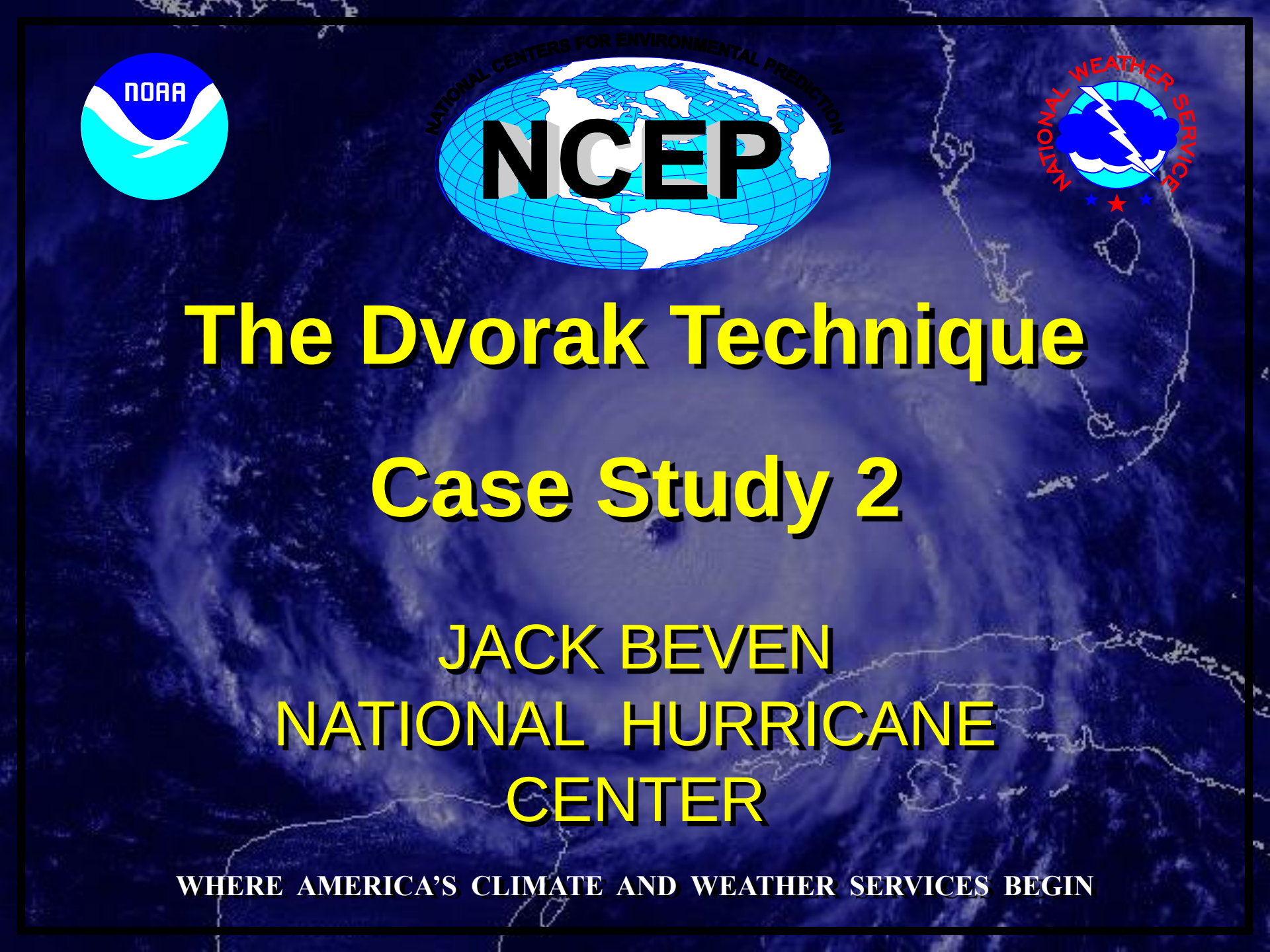


The Dvorak Technique

Case Study 2

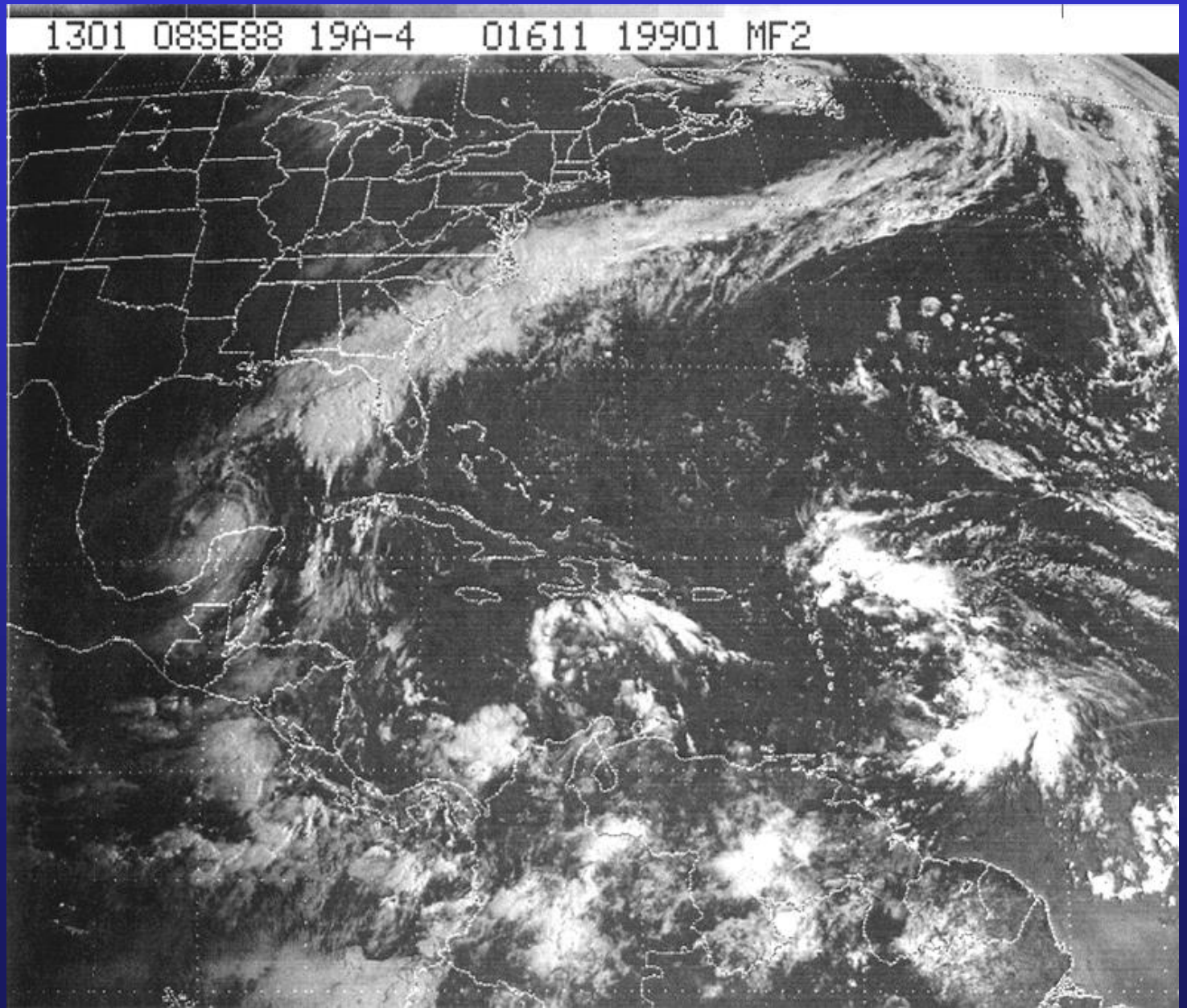
JACK BEVEN
NATIONAL HURRICANE CENTER

WHERE AMERICA'S CLIMATE AND WEATHER SERVICES BEGIN

Objective

- To perform Dvorak intensity analyses on the complete life cycle of a tropical cyclone
- Note: The answers you get may differ somewhat from the solutions on the case study. This represents some of the normal subjectivity and uncertainty associated with the Dvorak technique.

1301 UTC 8 Sep 1988



Issues for 1301 UTC 8 Sep 1988

- This is the first classification - assume the system is developing and the MET=1.0
- What cloud pattern does it have?
- Is the DT representative of the true strength of the system?
- What are the constraints on the first classification?

TROPICAL CYCLONE ANALYSIS WORKSHEET

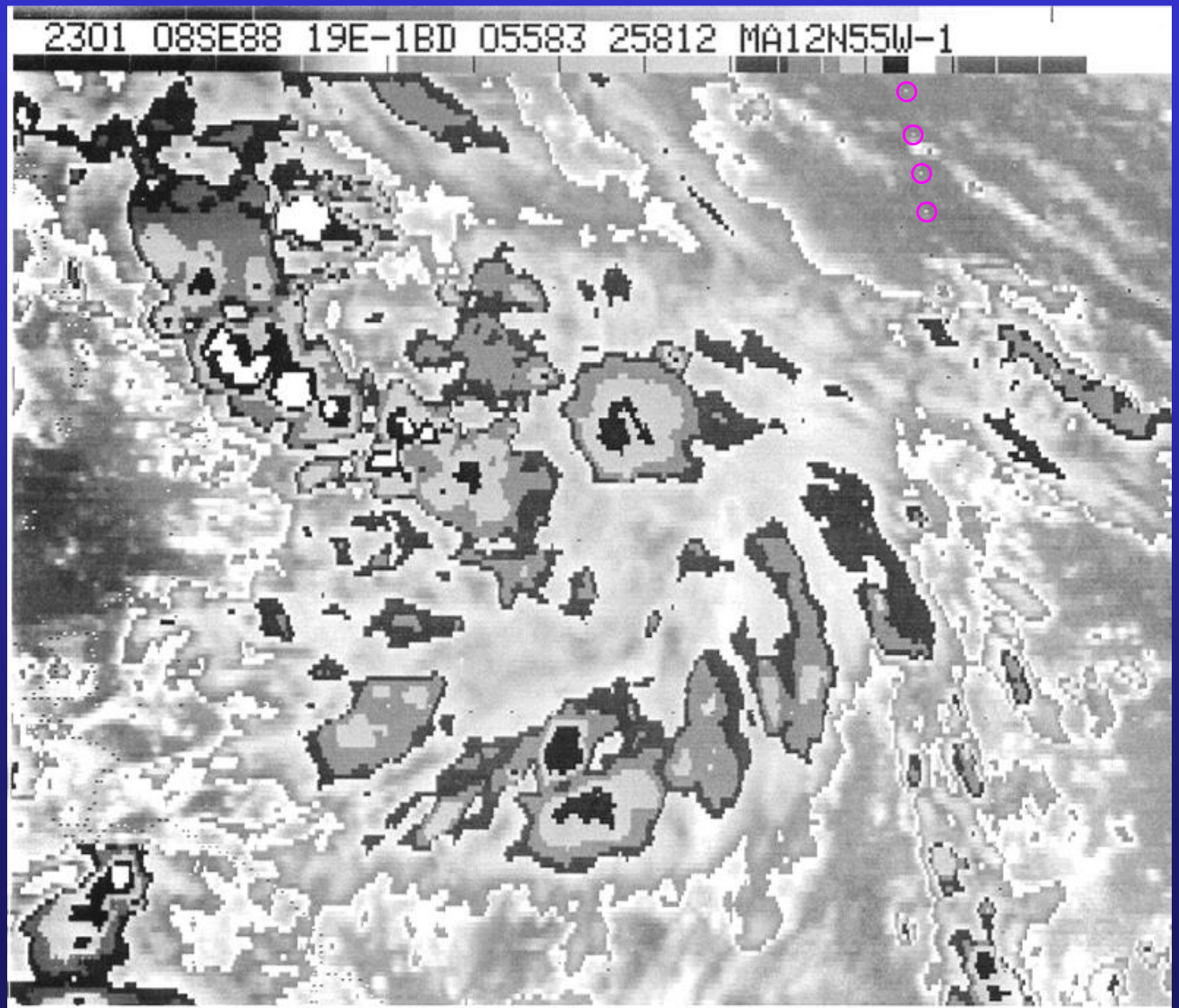
Vernon F. Dvorak
May 1982

T-NUMBER ESTIMATE FROM MEASUREMENTS FOR DATA T-NUMBER (DT) COMPUTATION

T-NUMBER ESTIMATE FROM MODEL AND DT CONSTRAINTS

STEP →	1		2A,B				2C				2D	2E	Data T-Number Computation			3	4	5	6	7,8	9	10		INITIALS
DESCRIPTION →	Location		Curved Band or Shear				Eye		$E_{No}+E_{Adj}=CF$		CDO	Emb. Centr				CCC	Trend	MET	PAT	FT	CI	24-Hr. Fcst.		
RULES →	Locate Cloud System Center at focal point of cloud curvature		Use Spiral Arc Length				(VIS) Use Embedded Distance	(IR/) Use Surrounding Temperature	From Rules	Eye Definition	Use Size Central Dense Overcast	(IR/) Use Surrounding Temperature	CF+BF=DT			Use Rules Central Cold Cover	24-Hr change D-developing W-weakening S-same	Model Expected T-Number	Pattern T-Number	Use Rules Final T-Number	Current Intensity Number	Adj. Model Fcst. if nec. Last Rule Used	Forecast Intensity Number	
DATE/TIME	LAT	LONG	DT1.5	DT2.5	DT3.5	DT4.5			E_{No}	E_{Adj}			CF	BF	DT									
08/1301				0.4											2.5		D	1.0	2.0	1.5	1.5	P	2.5	

2301 UTC 8 Sep 1988



Issues for 2301 UTC 8 Sep 1988

- Assume the system is developing and the MET=1.5
- What cloud pattern does it have and can it be measured?
- If no DT number can be determined, what do you do?

TROPICAL CYCLONE ANALYSIS WORKSHEET

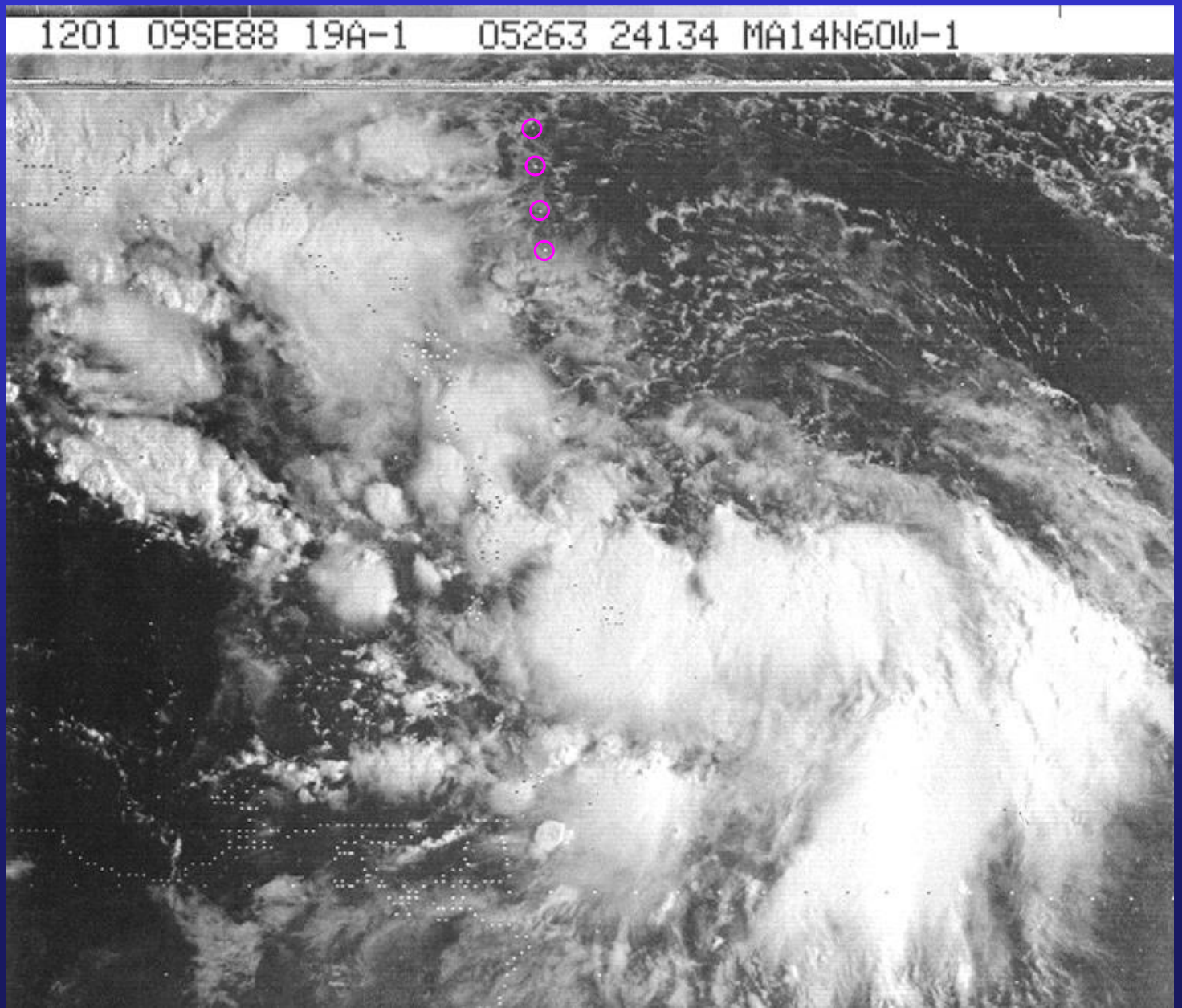
Vernon F. Dvorak
May 1982

T-NUMBER ESTIMATE FROM MEASUREMENTS FOR DATA T-NUMBER (DT) COMPUTATION

T-NUMBER ESTIMATE FROM MODEL AND DT CONSTRAINTS

STEP →	1		2A,B				2C				2D	2E	Data T-Number Computation			3	4	5	6	7,8	9	10		INITIALS
DESCRIPTION →	Location		Curved Band or Shear				Eye		$E_{No}+E_{Adj}=CF$		CDO	Emb. Centr				CCC	Trend	MET	PAT	FT	CI	24-Hr. Fcst.		
RULES →	Locate Cloud System Center at focal point of cloud curvature		Use Spiral Arc Length				(WSI) Use Embedded Distance	(IR) Use Surrounding Temperature	From Rules	Eye Definition	Use Size Central Dense Overcast	(IR) Use Surrounding Temperature	CF+BF=DT			Use Rules Central Cold Cover	24-Hr change D-developing W-weakening S-same	Model Expected T-Number	Pattern T-Number	Use Rules Final T-Number	Current Intensity Number	Adj. Model Fcst. if nec. Last Rule Used	Forecast Intensity Number	
DATE/TIME	LAT	LONG	DT 1.5	DT 2.5	DT 3.5	DT 4.5			E_{No}	E_{Adj}			CF	BF	DT									
08/1301				0.4											2.5		D	1.0	2.0	1.5	1.5	P	2.5	
08/2301			NO DT - USE RULES														D	1.5	1.5	1.5	1.5	P	2.5	

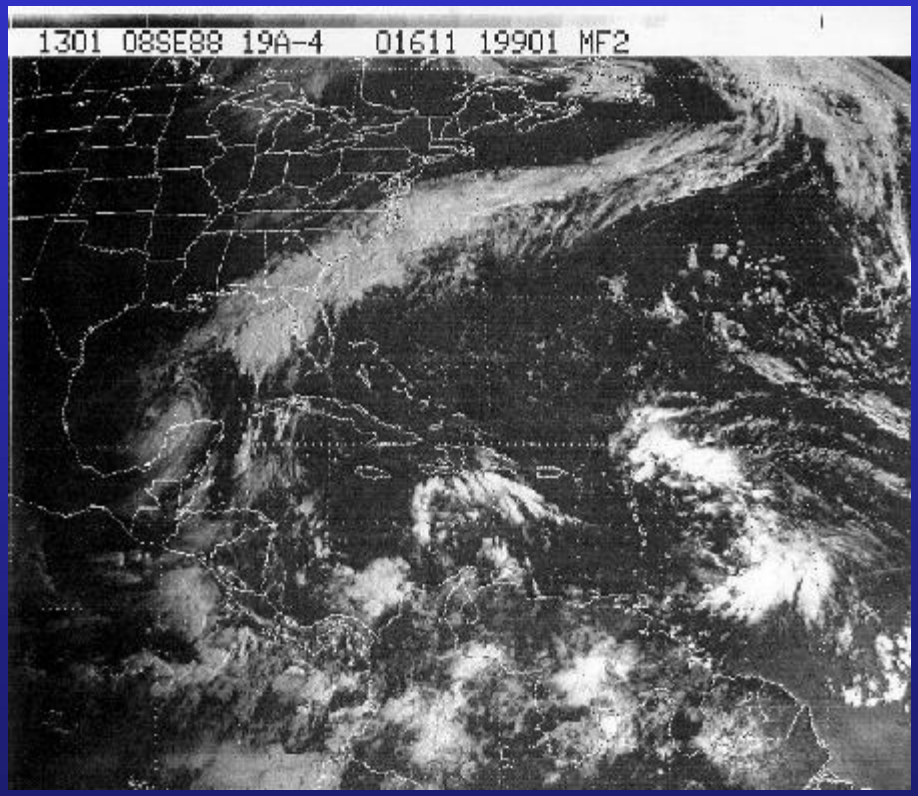
1201 UTC 9 Sep 1988

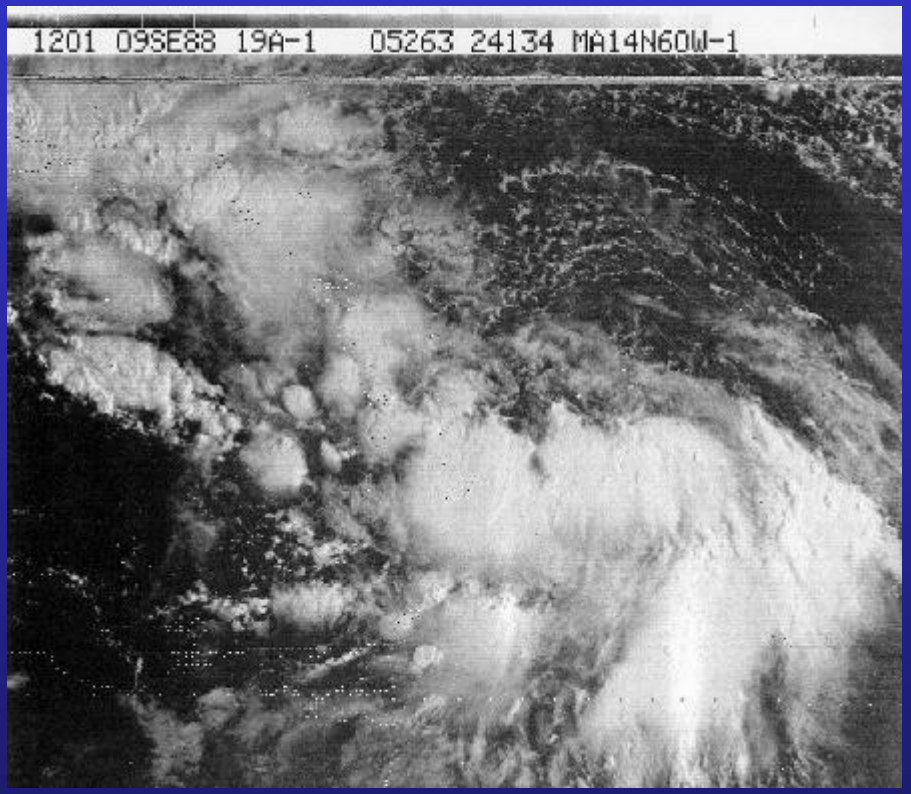


Issues for 1201 UTC 9 Sep 1988

- How has the system changed during the last 24 hours?
- What clues are there of this in the imagery?
- What cloud pattern can be used to measure this system?
- Is the cloud pattern clear cut?

24 hr change?





D

TROPICAL CYCLONE ANALYSIS WORKSHEET

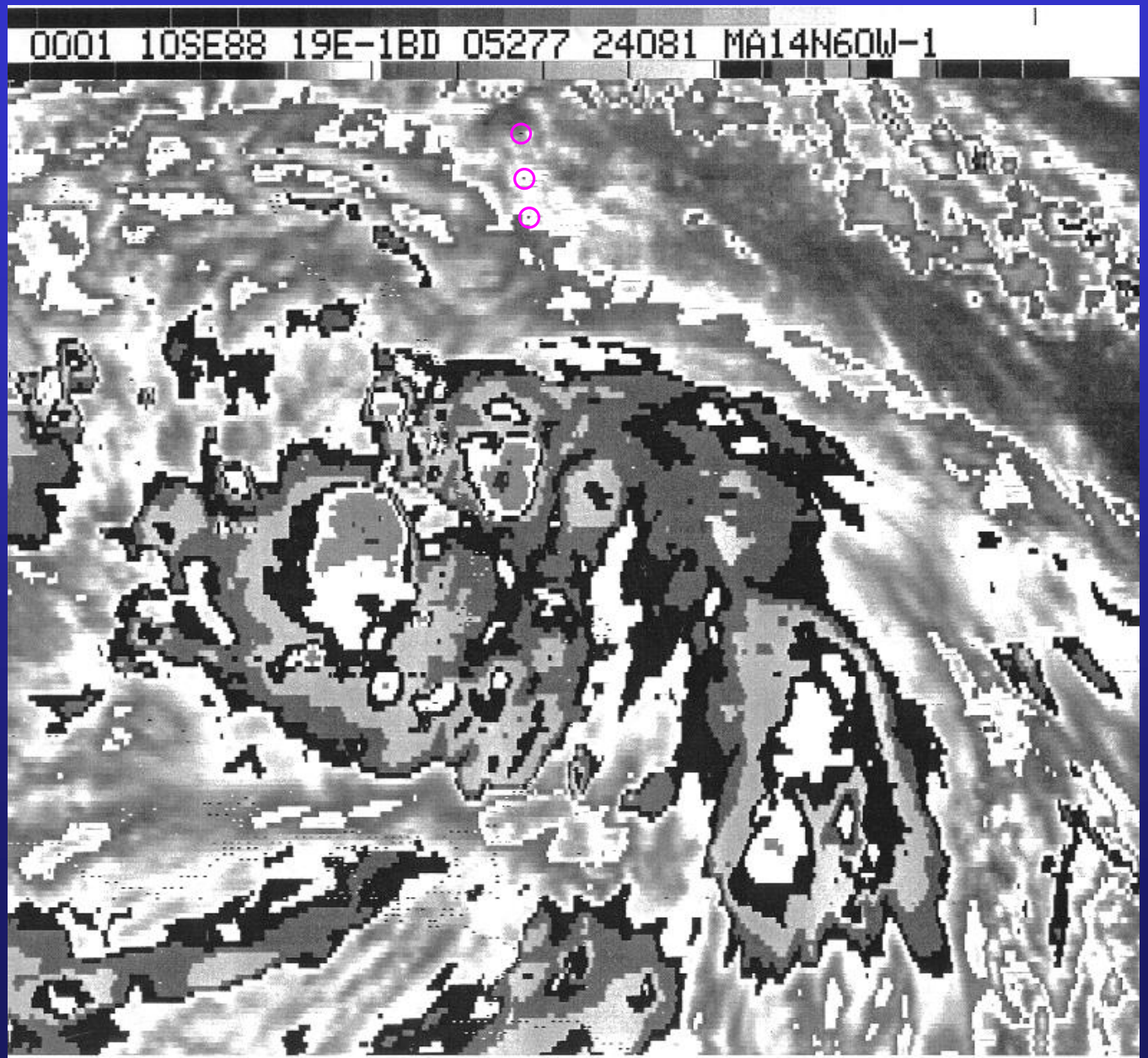
Vernon F. Dvorak
May 1982

T-NUMBER ESTIMATE FROM MEASUREMENTS FOR DATA T-NUMBER (DT) COMPUTATION

T-NUMBER ESTIMATE FROM MODEL AND DT CONSTRAINTS

STEP →	1		2A,B				2C				2D	2E				3	4	5	6	7,8	9	10		INITIALS
DESCRIPTION →	Location		Curved Band or Shear				Eye		$E_{No}+E_{Adj}=CF$		CDO	Emb. Centr.	Data T-Number Computation			CCC	Trend	MET	PAT	FT	CI	24-Hr. Fcst.		
RULES →	Locate Cloud System Center at focal point of cloud curvature		Use Spiral Arc Length				(VIS) Use Embedded Distance	(EIR) Use Surrounding Temperature	From Rules	Eye Definition	Use Size	(EIR) Use Surrounding Temperature	CF+BF=DT			Use Rules	24-Hr change			Use Rules		Adj. Model Fcst. if nec.		
			DT 1.5	DT 2.5	DT 3.5	DT 4.5					Central Dense Overcast					Central Cold Cover	D-developing W-weakening S-same	Model Expected T-Number	Pattern T-Number	Final T-Number	Current Intensity Number	List Rule Used	Forecast Intensity Number	
DATE/TIME	LAT	LONG							E_{No}	E_{Adj}			CF	BF	DT									
08/1301				0.4											2.5		D	1.0	2.0	1.5	1.5	P	2.5	
08/2301			NO DT - USE RULES														D	1.5	1.5	1.5	1.5	P	2.5	
09/1201		SHEAR 0.8°													2.0		D	2.5	2.0	2.0	2.0	P	2.5	

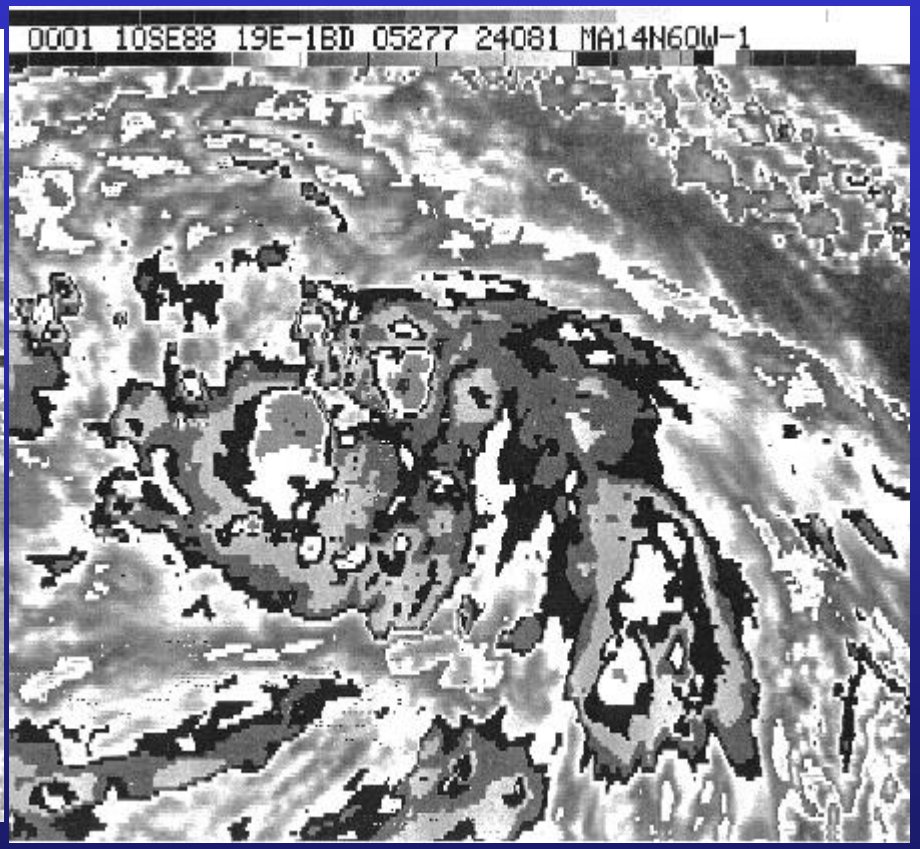
0001 UTC 10 Sep 1988



Issues for 0001 UTC 10 Sep 1988

- How has the system changed during the last 24 hours?
- What cloud pattern can be used to measure this system?
- Is the cloud pattern clear cut?

24 hr change?



D

TROPICAL CYCLONE ANALYSIS WORKSHEET

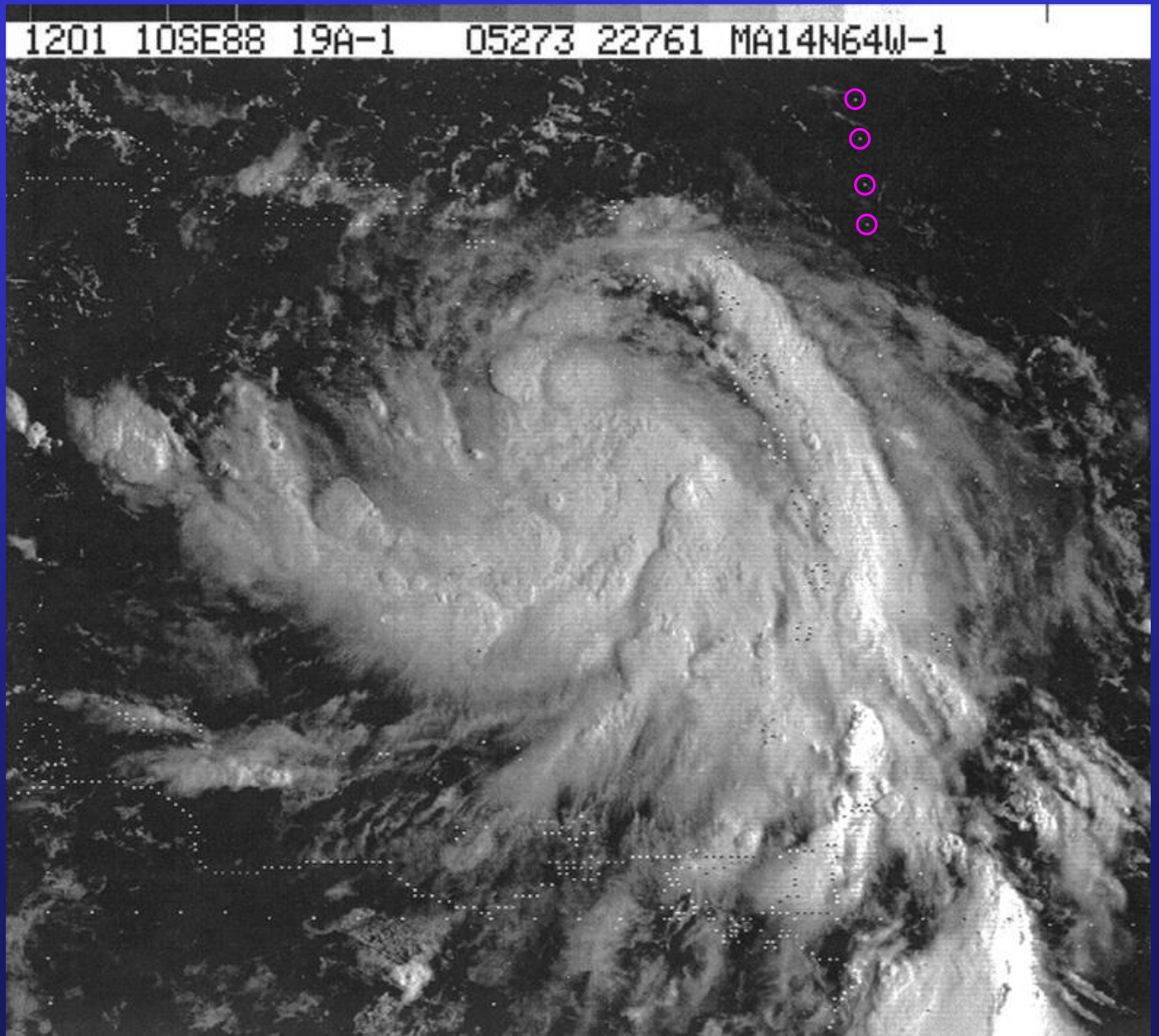
Vernon F. Dvorak
May 1982

T-NUMBER ESTIMATE FROM MEASUREMENTS FOR DATA T-NUMBER (DT) COMPUTATION

T-NUMBER ESTIMATE FROM MODEL AND DT CONSTRAINTS

STEP →	1		2A,B				2C				2D	2E				3	4	5	6	7,8	9	10		INITIALS
DESCRIPTION →	Location		Curved Band or Shear				Eye		$E_{No}+E_{Adj}=CF$		CDO	Emb. Centr.	Data T-Number Computation			CCC	Trend	MET	PAT	FT	CI	24-Hr. Fcst.		
RULES →	Locate Cloud System Center at focal point of cloud curvature		Use Spiral Arc Length				(VIS) Use Embedded Distance	(EIR) Use Surrounding Temperature	From Rules	Eye Definition	Use Size	(EIR) Use Surrounding Temperature	CF+BF=DT			Use Rules	24-Hr change			Use Rules		Adj. Model Fcst. if nec.		
			DT 1.5	DT 2.5	DT 3.5	DT 4.5					Central Dense Overcast					Central Cold Cover	D-developing W-weakening S-same							
DATE/TIME	LAT	LONG							E_{No}	E_{Adj}			CF	BF	DT			Model Expected T-Number	Pattern T-Number	Final T-Number	Current Intensity Number	List Rule Used	Forecast Intensity Number	
08/1301				0.4											2.5		D	1.0	2.0	1.5	1.5	P	2.5	
08/2301			NO DT - USE RULES														D	1.5	1.5	1.5	1.5	P	2.5	
09/1201		SHEAR	0.8°												2.0		D	2.5	2.0	2.0	2.0	P	2.5	
10/0001				0.65											3.0		D	2.5	3.0	2.5	2.5	P	3.5	

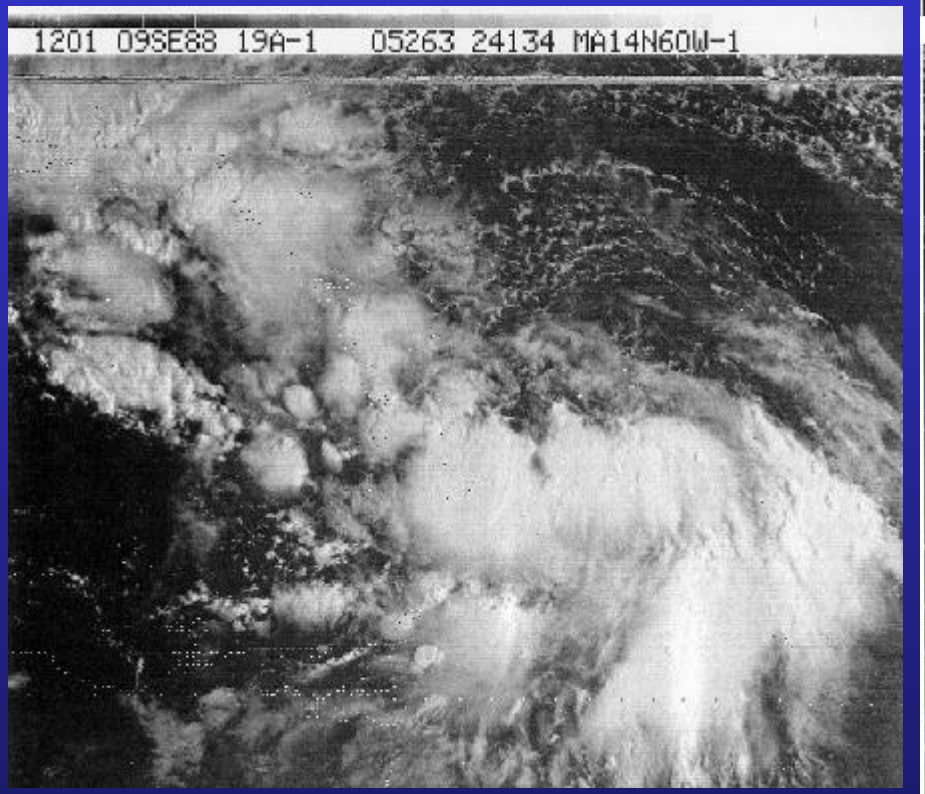
1201 UTC 10 Sep 1988

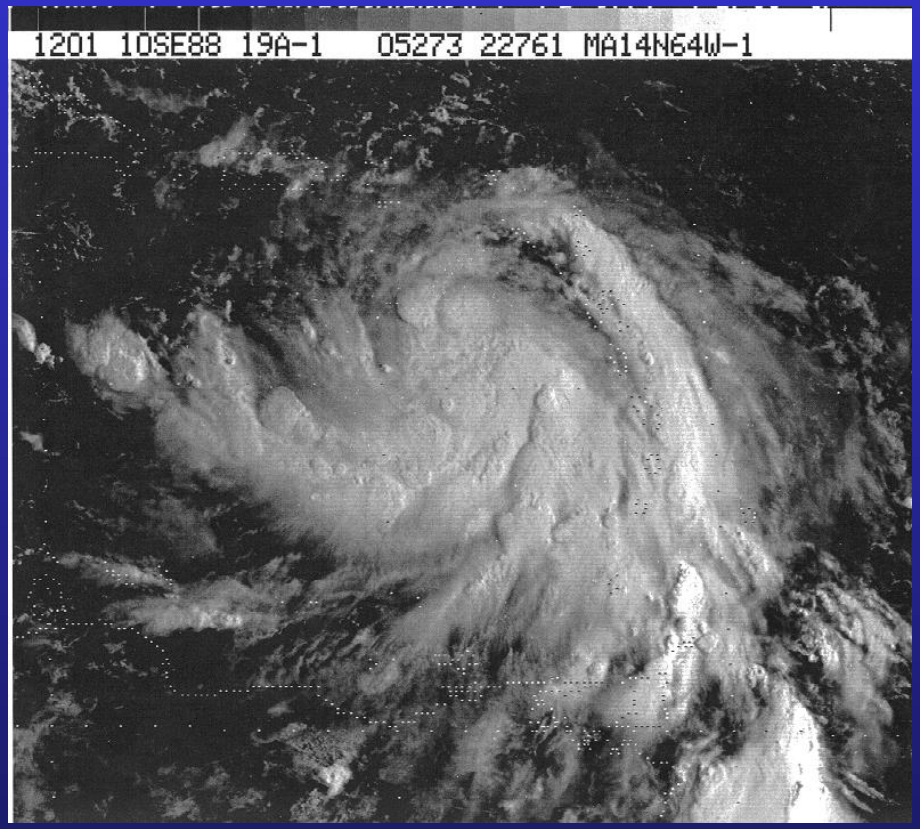


Issues for 1201 UTC 10 Sep 1988

- How has the system changed during the last 24 hours?
- What cloud pattern(s) can be used to measure this system?
- Is the cloud pattern(s) clear cut? If you tried multiple cloud patterns, do they give the same DT?

24 hr change?





D

TROPICAL CYCLONE ANALYSIS WORKSHEET

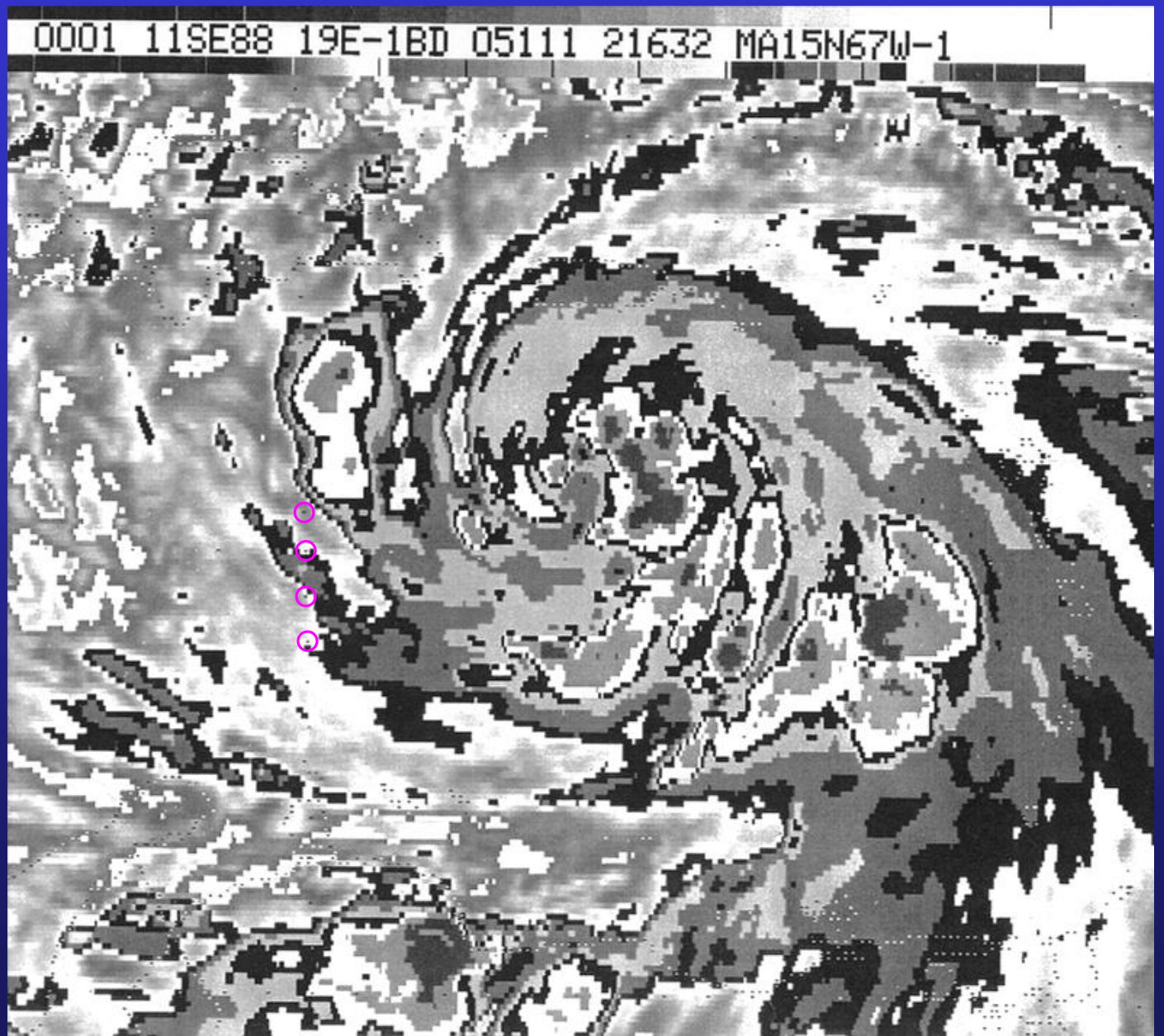
Vernon F. Dvorak
May 1982

T-NUMBER ESTIMATE FROM MEASUREMENTS FOR DATA T-NUMBER (DT) COMPUTATION

T-NUMBER ESTIMATE FROM MODEL AND DT CONSTRAINTS

STEP →	1		2A,B				2C				2D	2E				3	4	5	6	7,8	9	10		
DESCRIPTION →	Location		Curved Band or Shear				Eye		$E_{No}+E_{Adj}=CF$		CDO	Emb. Centr.	Data T-Number Computation			CCC	Trend	MET	PAT	FT	CI	24-Hr. Fcst.		
RULES →	Locate Cloud System Center at focal point of cloud curvature		Use Spiral Arc Length				(VIS) Use Embedded Distance	(EIR) Use Surrounding Temperature	From Rules	Eye Definition	Use Size	(EIR) Use Surrounding Temperature	CF+BF=DT			Use Rules	24-Hr change	Model Expected T-Number	Pattern T-Number	Use Rules	Current Intensity Number	Adj. Model Fcst. if nec.		INITIALS
			DT 1.5	DT 2.5	DT 3.5	DT 4.5										Central Cold Cover	D-developing W-weakening S-same	Final T-Number				List Rule Used	Forecast Intensity Number	
DATE/TIME	LAT	LONG							E_{No}	E_{Adj}	Central Dense Overcast		CF	BF	DT									
08/1301				0.4											2.5		D	1.0	2.0	1.5	1.5	P	2.5	
08/2301			NO DT - USE RULES														D	1.5	1.5	1.5	1.5	P	2.5	
09/1201		SHEAR	0.8°												2.0		D	2.5	2.0	2.0	2.0	P	2.5	
10/0001				0.65											3.0		D	2.5	3.0	2.5	2.5	P	3.5	
10/1201				0.65											3.0		D	3.0	3.0	3.0	3.0	P	4.0	
10/1201							IRREGULAR				1.5°		2.5+	0.5	3.0+									

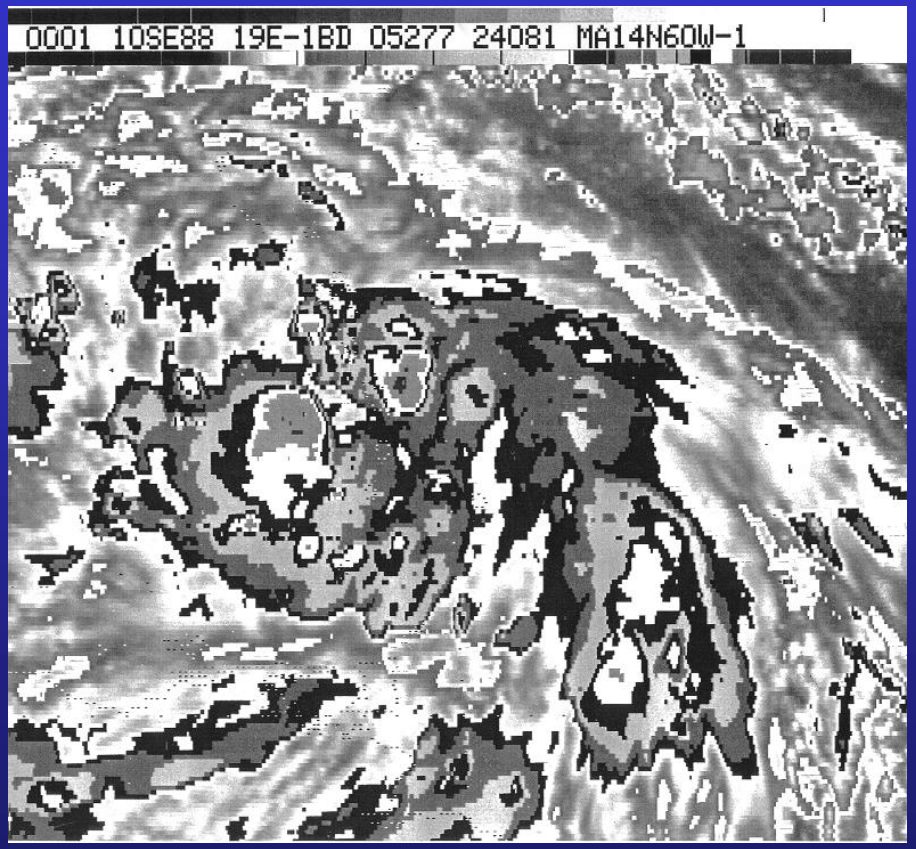
0001 UTC 11 Sep 1988

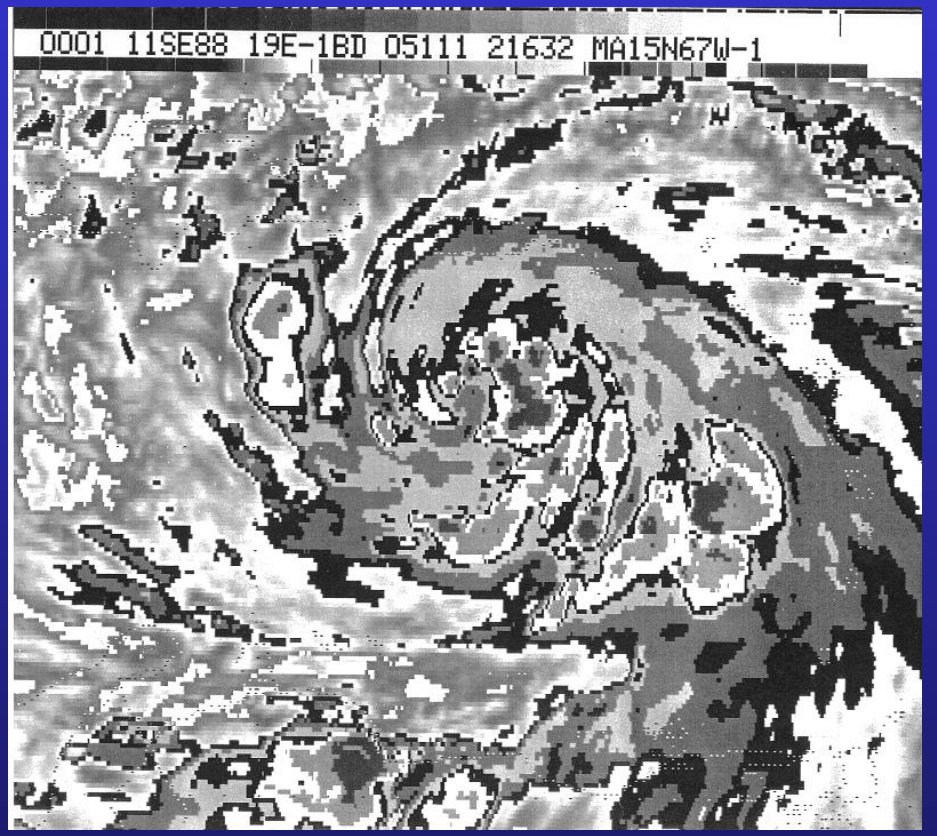


Issues for 0001 UTC 11 Sep 1988

- How has the system changed during the last 24 hours? Is it time to change the model development rate?
- What cloud pattern(s) can be used to measure this system? What cloud patterns cannot be used?
- Is the cloud pattern(s) clear cut? If you tried multiple cloud patterns, do they give the same DT?

24 hr change?





D

TROPICAL CYCLONE ANALYSIS WORKSHEET

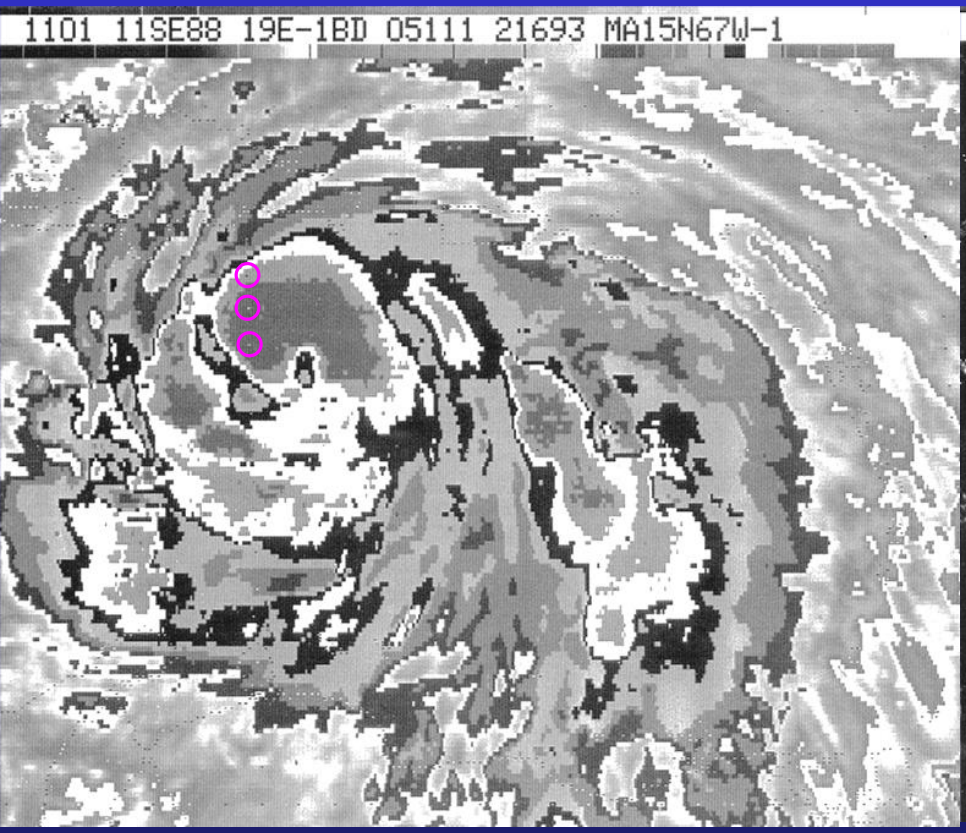
Vernon F. Dvorak
May 1982

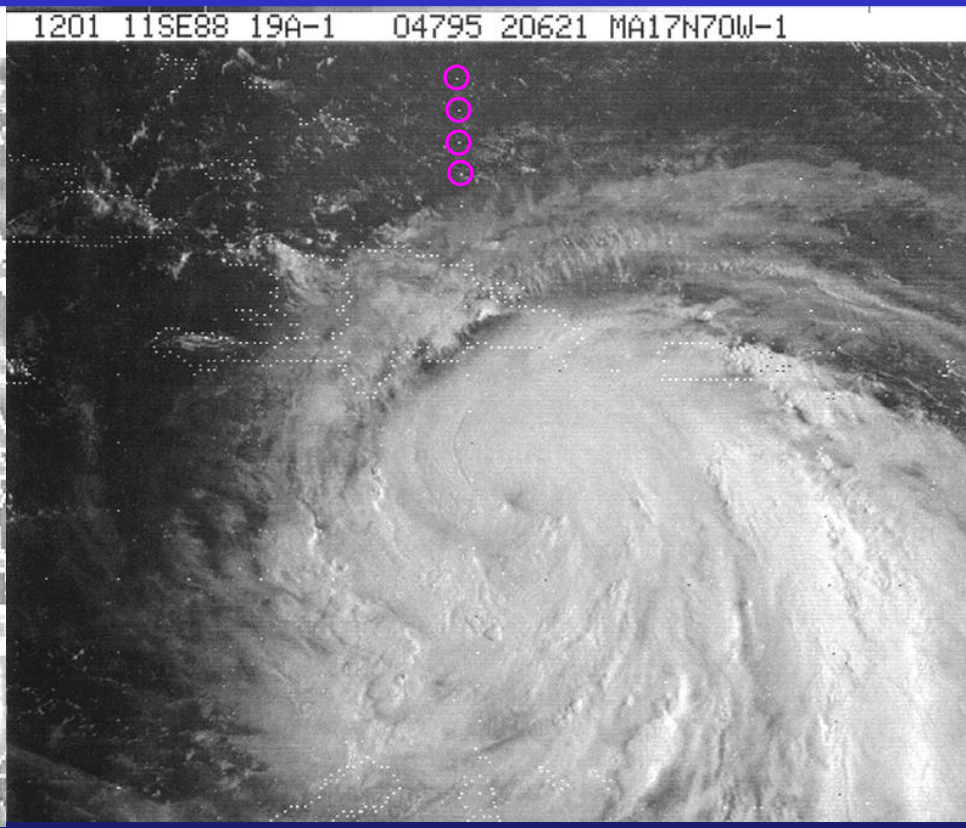
T-NUMBER ESTIMATE FROM MEASUREMENTS FOR DATA T-NUMBER (DT) COMPUTATION

T-NUMBER ESTIMATE FROM MODEL AND DT CONSTRAINTS

STEP →	1		2A,B				2C				2D	2E				3	4	5	6	7,8	9	10		INITIALS
DESCRIPTION →	Location		Curved Band or Shear				Eye		$E_{No}+E_{Adj}=CF$		CDO	Emb. Centr.	Data T-Number Computation			CCC	Trend	MET	PAT	FT	CI	24-Hr. Fcst.		
RULES →	Locate Cloud System Center at focal point of cloud curvature		Use Spiral Arc Length				(VIS) Use Embedded Distance	(EIR) Use Surrounding Temperature	From Rules	Eye Definition	Use Size	(EIR) Use Surrounding Temperature	CF+BF=DT			Use Rules	24-Hr change	Model Expected T-Number	Pattern T-Number	Use Rules	Current Intensity Number	Adj. Model Fcst. if nec.		
			DT 1.5	DT 2.5	DT 3.5	DT 4.5					Central Dense Overcast					Central Cold Cover	D-developing W-weakening S-same			Final T-Number		List Rule Used	Forecast Intensity Number	
DATE/TIME	LAT	LONG							E_{No}	E_{Adj}			CF	BF	DT									
08/1301				0.4											2.5		D	1.0	2.0	1.5	1.5	P	2.5	
08/2301			NO DT - USE RULES														D	1.5	1.5	1.5	1.5	P	2.5	
09/1201		SHEAR	0.8°												2.0		D	2.5	2.0	2.0	2.0	P	2.5	
10/0001				0.65											3.0		D	2.5	3.0	2.5	2.5	P	3.5	
10/1201				0.65											3.0		D	3.0	3.0	3.0	3.0	P	4.0	
10/1201							IRREGULAR				1.5°		2.5+	0.5	3.0+									
11/0001						1.2									4.0		D	3.5	4.5	4.0	4.0	C	5.5	
11/0001			DG	EYE IN		MG		MG	4.5	-0.5			4.0	0.0	4.0									

1101/1201 UTC 11 Sep 1988

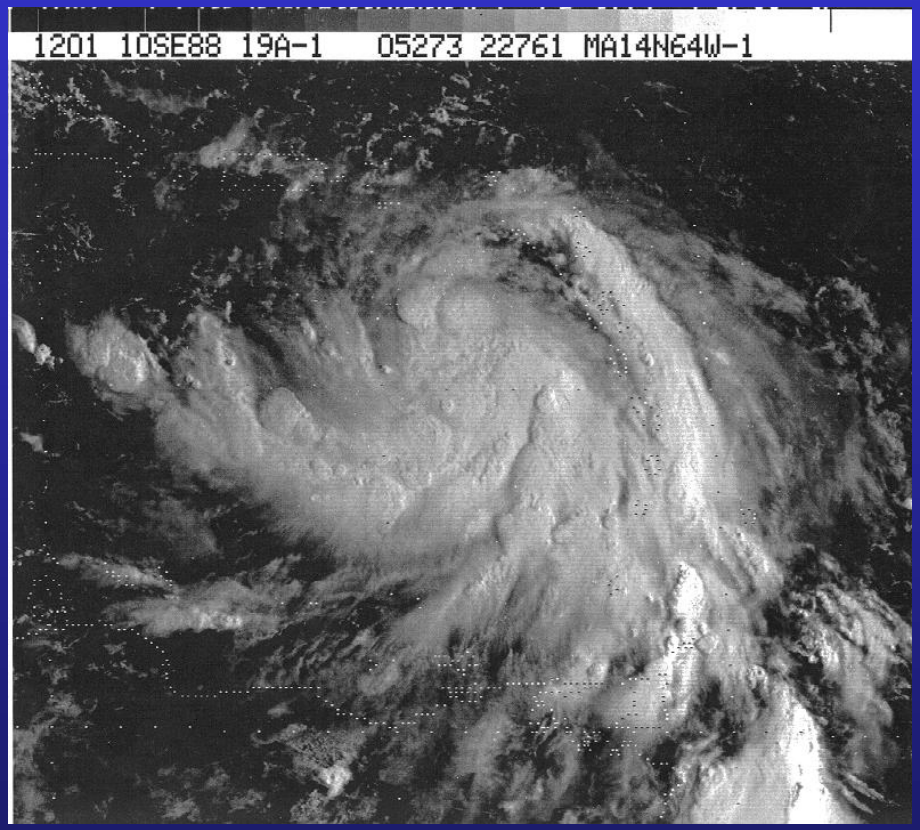


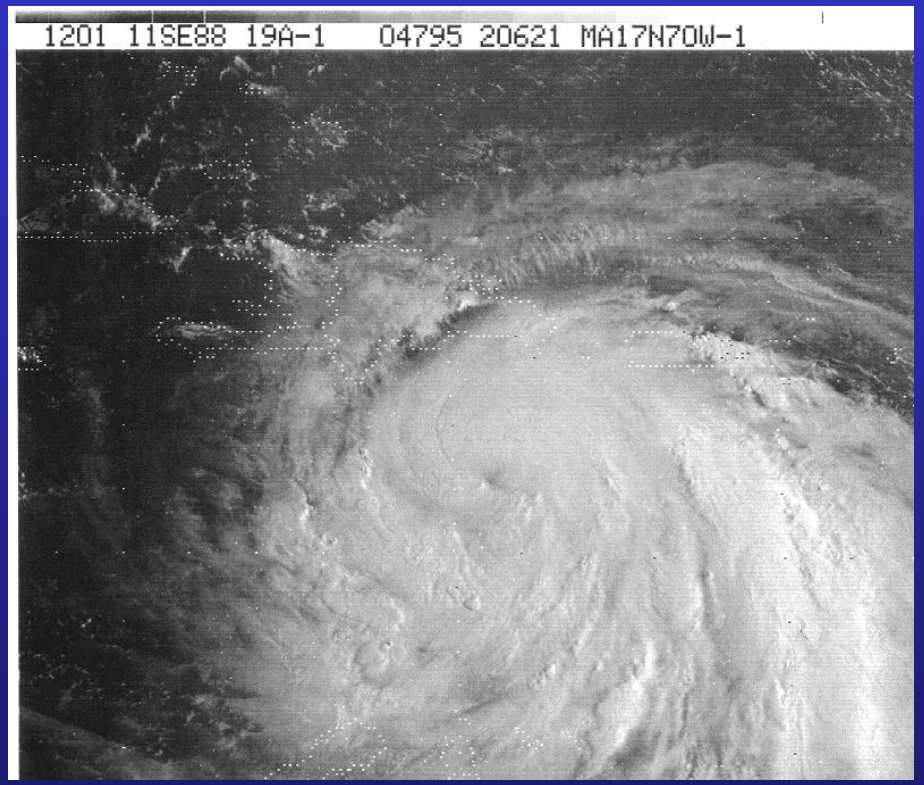


Issues for 1101/1201 UTC 11 Sep 1988

- How has the system changed during the last 24 hours? Is it time to change the model development rate?
- What cloud patterns can be used to measure this system? What cloud pattern might be best?
- If you tried multiple cloud patterns, do they give the same DT?
- Beware constraints?

24 hr change?





D+

TROPICAL CYCLONE ANALYSIS WORKSHEET

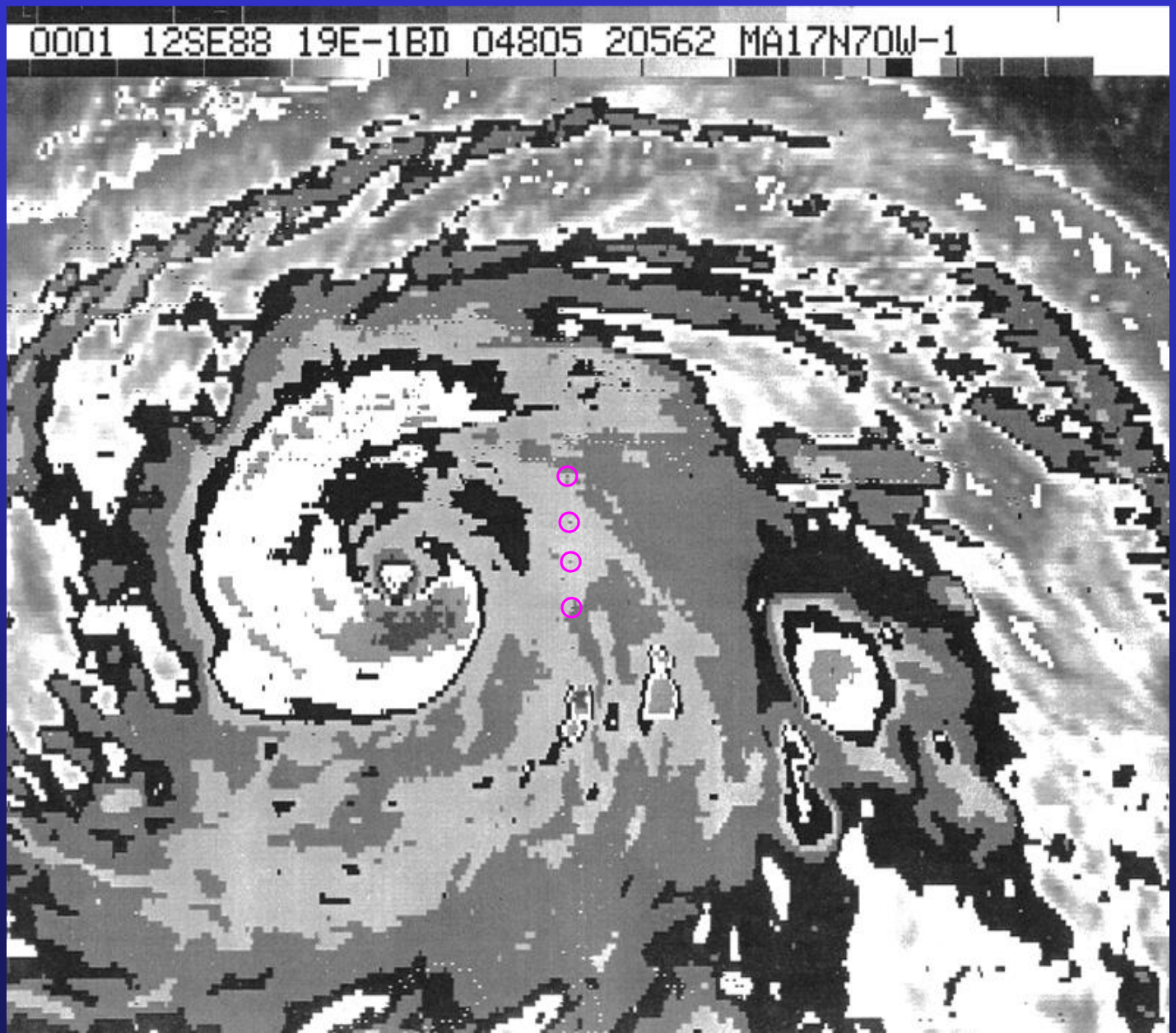
Vernon F. Dvorak
May 1982

T-NUMBER ESTIMATE FROM MEASUREMENTS FOR DATA T-NUMBER (DT) COMPUTATION

T-NUMBER ESTIMATE FROM MODEL AND DT CONSTRAINTS

STEP →	1		2A,B				2C				2D	2E				3	4	5	6	7,8	9	10		
DESCRIPTION →	Location		Curved Band or Shear				Eye		$E_{No}+E_{Adj}=CF$		CDO	Emb. Centr.	Data T-Number Computation			CCC	Trend	MET	PAT	FT	CI	24-Hr. Fcst.		
RULES →	Locate Cloud System Center at focal point of cloud curvature		Use Spiral Arc Length				(VIS) Use Embedded Distance	(EIR) Use Surrounding Temperature	From Rules	Eye Definition	Use Size	(EIR) Use Surrounding Temperature	CF+BF=DT			Use Rules	24-Hr change	Model Expected T-Number	Pattern T-Number	Use Rules	Current Intensity Number	Adj. Model Fcst. if nec.		INITIALS
			DT 1.5	DT 2.5	DT 3.5	DT 4.5										Central Cold Cover	D-developing W-weakening S-same	Final T-Number				List Rule Used	Forecast Intensity Number	
DATE/TIME	LAT	LONG							E_{No}	E_{Adj}	Central Dense Overcast		CF	BF	DT									
08/1301				0.4											2.5		D	1.0	2.0	1.5	1.5	P	2.5	
08/2301			NO DT - USE RULES														D	1.5	1.5	1.5	1.5	P	2.5	
09/1201			SHEAR 0.8°												2.0		D	2.5	2.0	2.0	2.0	P	2.5	
10/0001				0.65											3.0		D	2.5	3.0	2.5	2.5	P	3.5	
10/1201				0.65											3.0		D	3.0	3.0	3.0	3.0	P	4.0	
10/1201							IRREGULAR				1.5°		2.5+	0.5	3.0+									
11/0001						1.2									4.0		D	3.5	4.5	4.0	4.0	C	5.5	
11/0001			DG EYE IN			MG		MG	4.5	-0.5			4.0	0.0	4.0									
11/1101			LG EYE IN			LG/W		LG	5.0+	0.0			5.0+	0.0	5.0+		D+	4.5	6.0	4.5	4.5	C	6.0	
11/1101												LG	4.5+	0.0	4.5+									
11/1201							0.5°		4.0	-0.5			3.5	1.0+	4.5+		D+	4.5	5.0	4.5+	4.5+	C	6.0	
11/1201						1.5									4.5									
11/1201							IRREGULAR				2.3°		3.0	1.0+	4.0+									

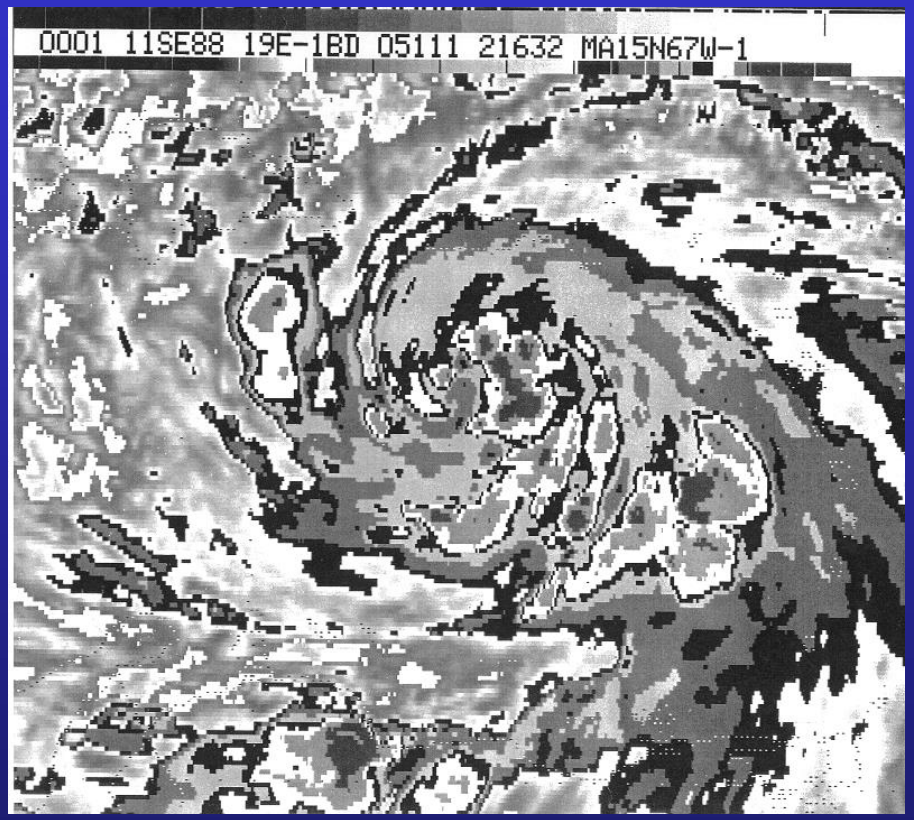
0001 UTC 12 Sep 1988

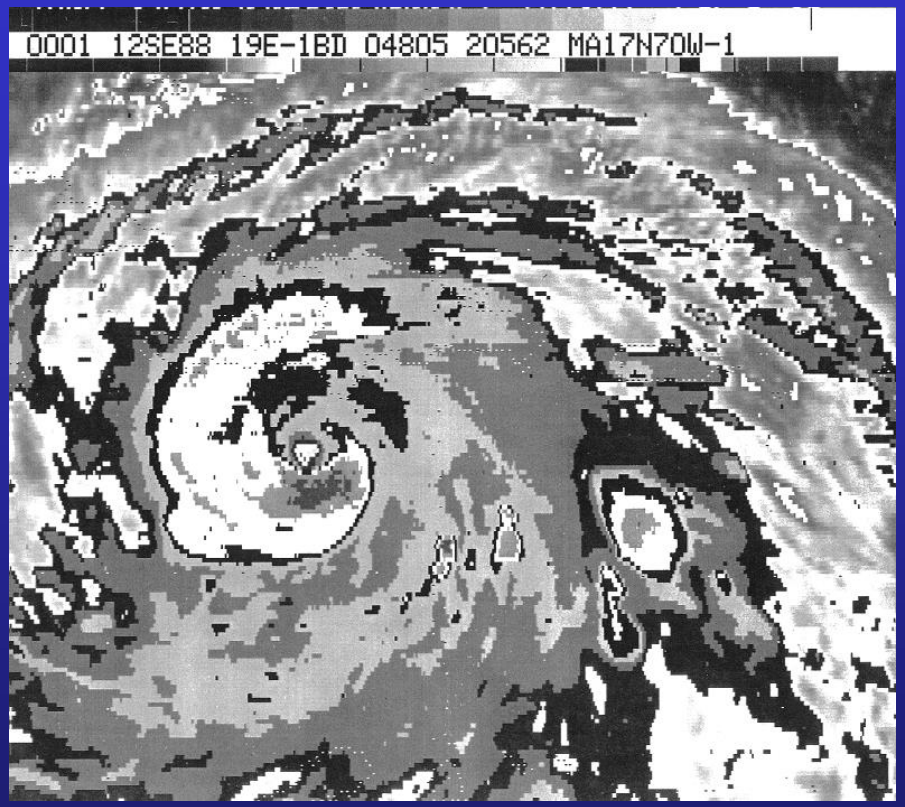


Issues for 0001 UTC 12 Sep 1988

- How has the system changed during the last 24 hours? Do we need to change the model development rate?
- What cloud pattern is best to measure this system?
- Is there a need for infrared banding?
- Which T-number should be the FT?
- Beware constraints?

24 hr change?





D+

TROPICAL CYCLONE ANALYSIS WORKSHEET

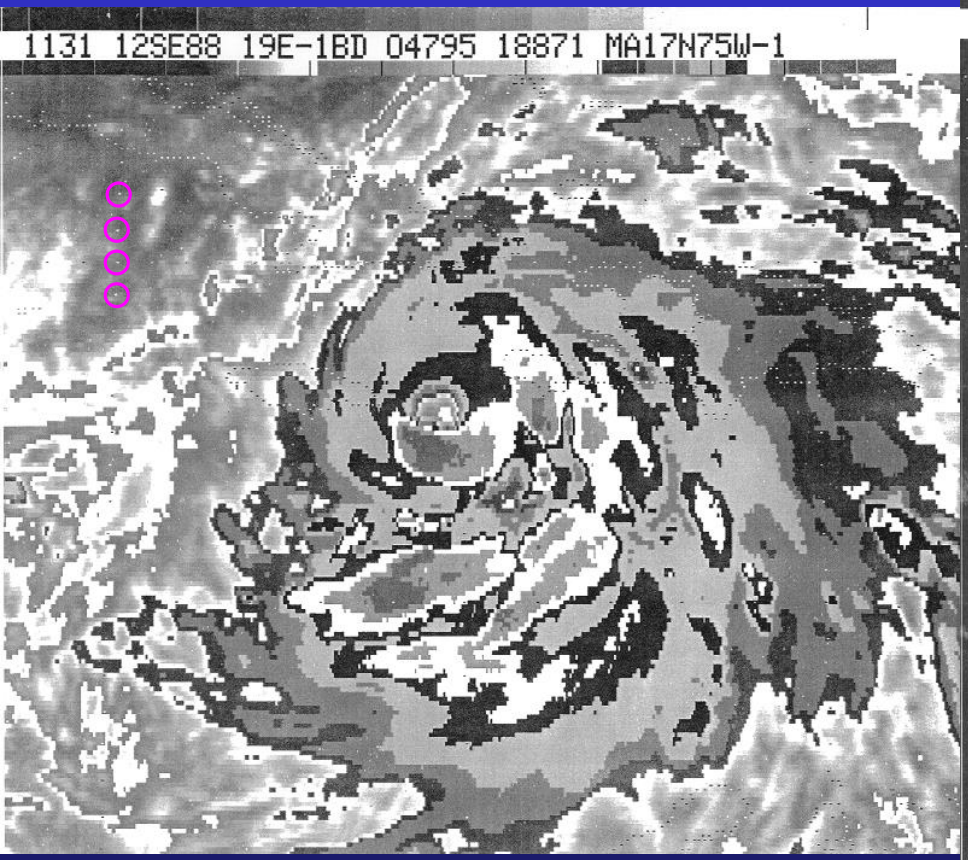
Vernon F. Dvorak
May 1982

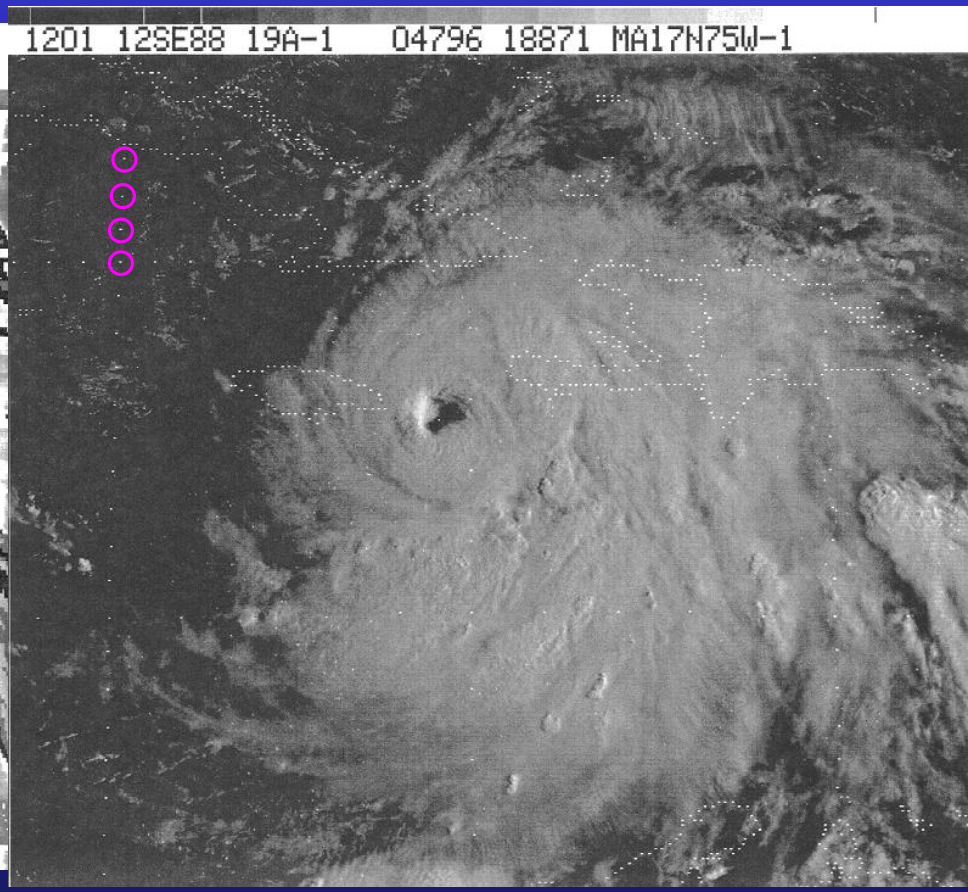
T-NUMBER ESTIMATE FROM MEASUREMENTS FOR DATA T-NUMBER (DT) COMPUTATION

T-NUMBER ESTIMATE FROM MODEL AND DT CONSTRAINTS

STEP →	1		2A,B				2C				2D	2E				3	4	5	6	7,8	9	10		
DESCRIPTION →	Location		Curved Band or Shear				Eye		$E_{No}+E_{Adj}=CF$		CDO	Emb. Centr.	Data T-Number Computation			CCC	Trend	MET	PAT	FT	CI	24-Hr. Fcst.		
RULES →	Locate Cloud System Center at focal point of cloud curvature		Use Spiral Arc Length				(VIS) Use Embedded Distance	(EIR) Use Surrounding Temperature	From Rules	Eye Definition	Use Size	(EIR) Use Surrounding Temperature	CF+BF=DT			Use Rules	24-Hr change			Use Rules		Adj. Model Fcst. if nec.		INITIALS
			DT 1.5	DT 2.5	DT 3.5	DT 4.5					Central Dense Overcast					Central Cold Cover	D-developing W-weakening S-same	Model Expected T-Number	Pattern T-Number	Final T-Number	Current Intensity Number	List Rule Used	Forecast Intensity Number	
DATE/TIME	LAT	LONG							E_{No}	E_{Adj}			CF	BF	DT									
08/1301				0.4											2.5		D	1.0	2.0	1.5	1.5	P	2.5	
08/2301			NO DT - USE RULES														D	1.5	1.5	1.5	1.5	P	2.5	
09/1201		SHEAR	0.8°												2.0		D	2.5	2.0	2.0	2.0	P	2.5	
10/0001				0.65											3.0		D	2.5	3.0	2.5	2.5	P	3.5	
10/1201				0.65											3.0		D	3.0	3.0	3.0	3.0	P	4.0	
10/1201							IRREGULAR				1.5°		2.5+	0.5	3.0+									
11/0001						1.2									4.0		D	3.5	4.5	4.0	4.0	C	5.5	
11/0001			DG EYE IN			MG		MG	4.5	-0.5			4.0	0.0	4.0									
11/1101		LG	EYE IN			LG/W		LG	5.0+	0.0			5.0+	0.0	5.0+		D+	4.5	6.0	4.5	4.5	C	6.0	
11/1101												LG	4.5+	0.0	4.5+									
11/1201							0.5°		4.0	-0.5			3.5	1.0+	4.5+		D+	4.5	5.0	4.5+	4.5+	C	6.0	
11/1201						1.5									4.5									
11/1201							IRREGULAR				2.3°		3.0	1.0+	4.0+									
12/0001			OW EYE IN			LG		LG	5.0	0.0			5.0	0.0	5.0		D+	5.5	5.5	5.0	5.0	P	6.0	

1131/1201 UTC 12 Sep 1988

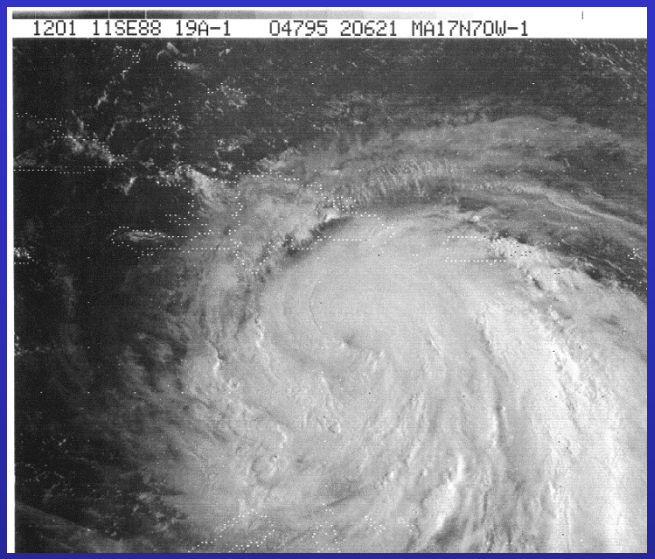


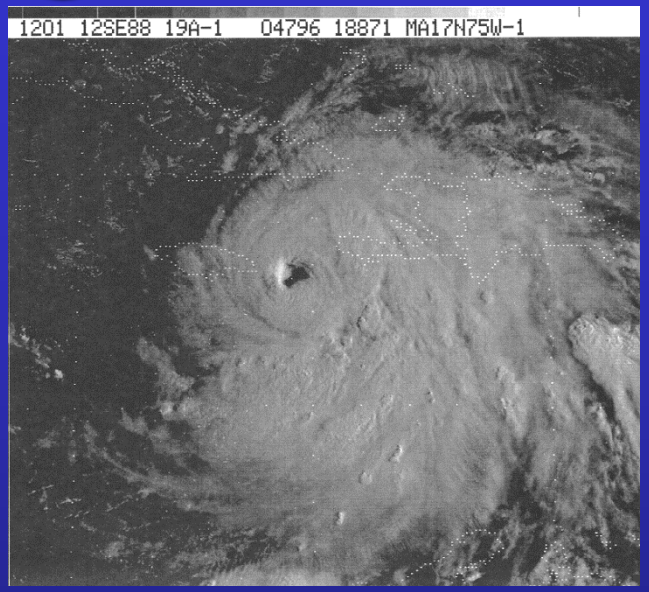


Issues for 1131/1201 UTC 12 Sep 1988

- How has the system changed during the last 24 hours? Is it time to change the model development rate?
- Is there anything unusual about the eye number and eye adjustment? How about the eye size?
- Beware constraints?

24 hr change?





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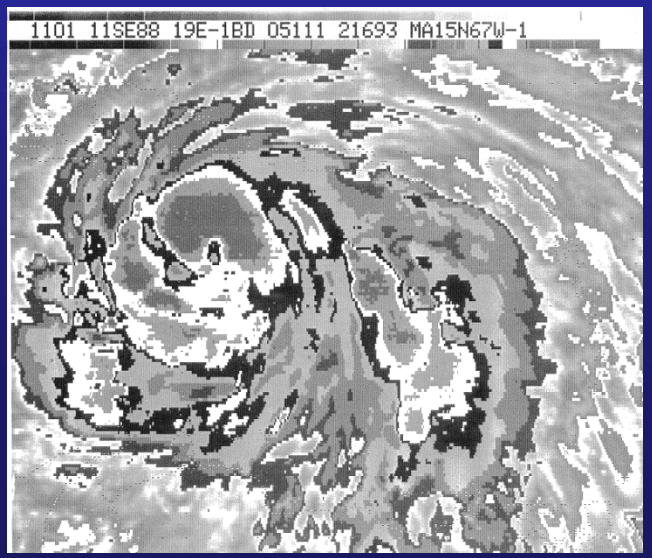
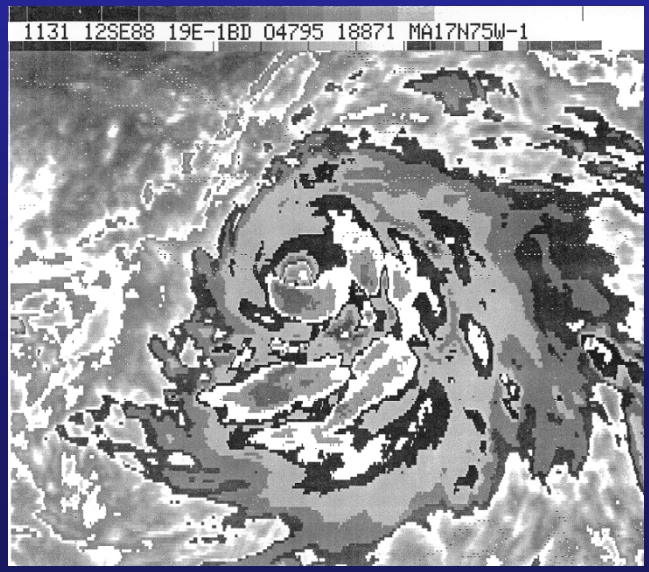




TROPICAL CYCLONE ANALYSIS WORKSHEET

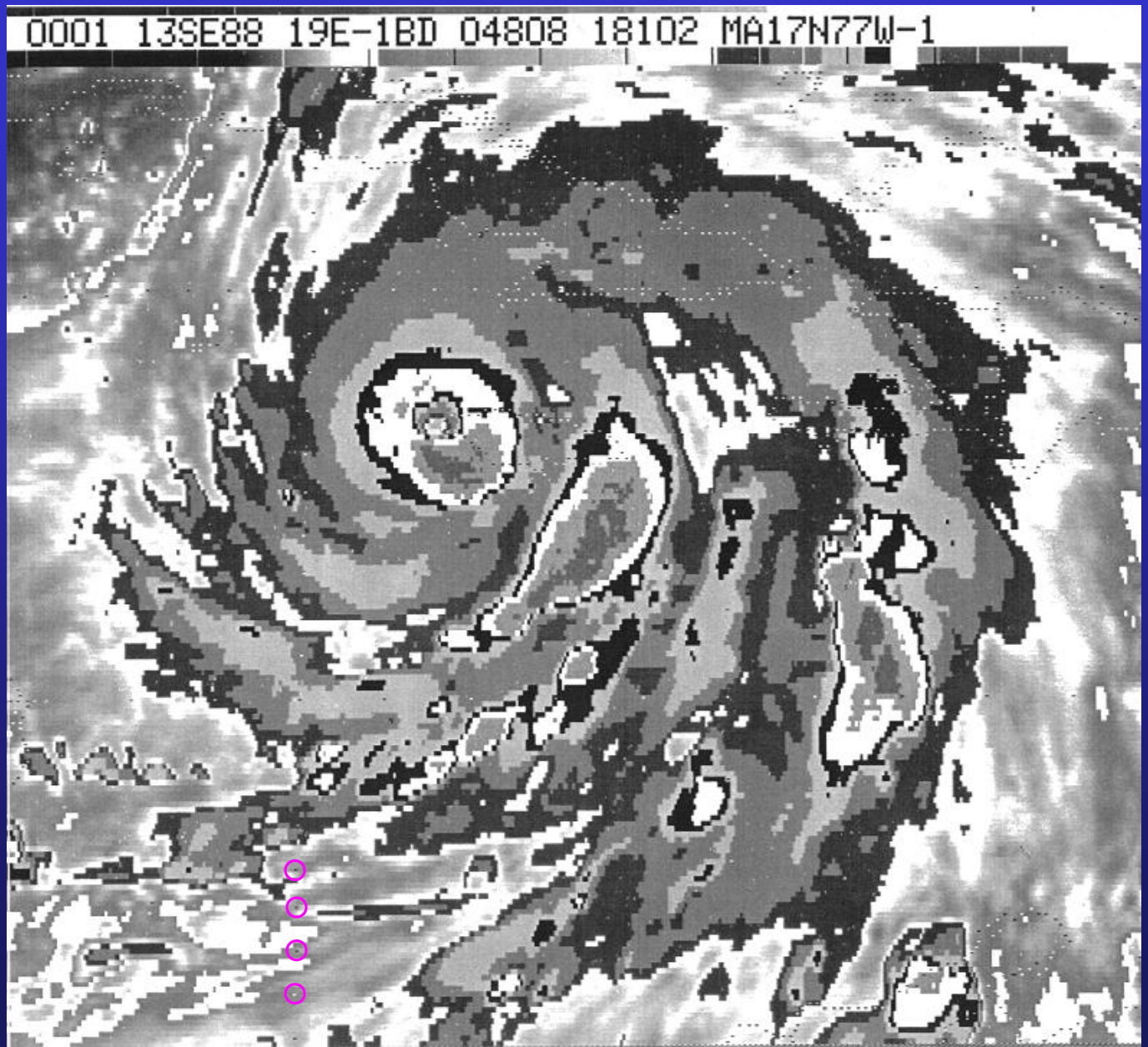
Vernon F. Dvorak
May 1982

T-NUMBER ESTIMATE FROM MEASUREMENTS FOR DATA T-NUMBER (DT) COMPUTATION

T-NUMBER ESTIMATE FROM MODEL AND DT CONSTRAINTS

STEP →	1		2A,B				2C				2D	2E				3	4	5	6	7,8	9	10		
DESCRIPTION →	Location		Curved Band or Shear				Eye		$E_{No}+E_{Adj}=CF$		CDO	Emb. Centr.	Data T-Number Computation			CCC	Trend	MET	PAT	FT	CI	24-Hr. Fcst.		
RULES →	Locate Cloud System Center at focal point of cloud curvature		Use Spiral Arc Length				(VIS) Use Embedded Distance	(EIR) Use Surrounding Temperature	From Rules	Eye Definition	Use Size	(EIR) Use Surrounding Temperature	CF+BF=DT			Use Rules	24-Hr change			Use Rules		Adj. Model Fcst. if nec.		INITIALS
			DT 1.5	DT 2.5	DT 3.5	DT 4.5										Central Cold Cover	D-developing W-weakening S-same	Model Expected T-Number	Pattern T-Number	Final T-Number	Current Intensity Number	List Rule Used	Forecast Intensity Number	
DATE/TIME	LAT	LONG							E_{No}	E_{Adj}			CF	BF	DT									
08/1301				0.4											2.5		D	1.0	2.0	1.5	1.5	P	2.5	
08/2301			NO DT - USE RULES														D	1.5	1.5	1.5	1.5	P	2.5	
09/1201		SHEAR	0.8°												2.0		D	2.5	2.0	2.0	2.0	P	2.5	
10/0001				0.65											3.0		D	2.5	3.0	2.5	2.5	P	3.5	
10/1201				0.65											3.0		D	3.0	3.0	3.0	3.0	P	4.0	
10/1201							IRREGULAR				1.5°		2.5+	0.5	3.0+									
11/0001						1.2									4.0		D	3.5	4.5	4.0	4.0	C	5.5	
11/0001			DG EYE IN			MG		MG	4.5	-0.5			4.0	0.0	4.0									
11/1101		LG	EYE IN LG/W					LG	5.0+	0.0			5.0+	0.0	5.0+		D+	4.5	6.0	4.5	4.5	C	6.0	
11/1101												LG	4.5+	0.0	4.5+									
11/1201							0.5°		4.0	-0.5			3.5	1.0+	4.5+		D+	4.5	5.0	4.5+	4.5+	C	6.0	
11/1201						1.5									4.5									
11/1201							IRREGULAR				2.3°		3.0	1.0+	4.0+									
12/0001			OW EYE IN			LG		LG	5.0	0.0			5.0	0.0	5.0		D+	5.5	5.5	5.0	5.0	P	6.0	
12/1131		WMG	EYE IN LG/B					LG	5.0	1.0			6.0	0.0	6.0		D+	6.0	5.5	6.0	6.0	C	7.5	
12/1201							0.9°		5.5	0.0			5.5	1.0	6.5		D+	6.0	5.5	6.0	6.0	C	7.5	

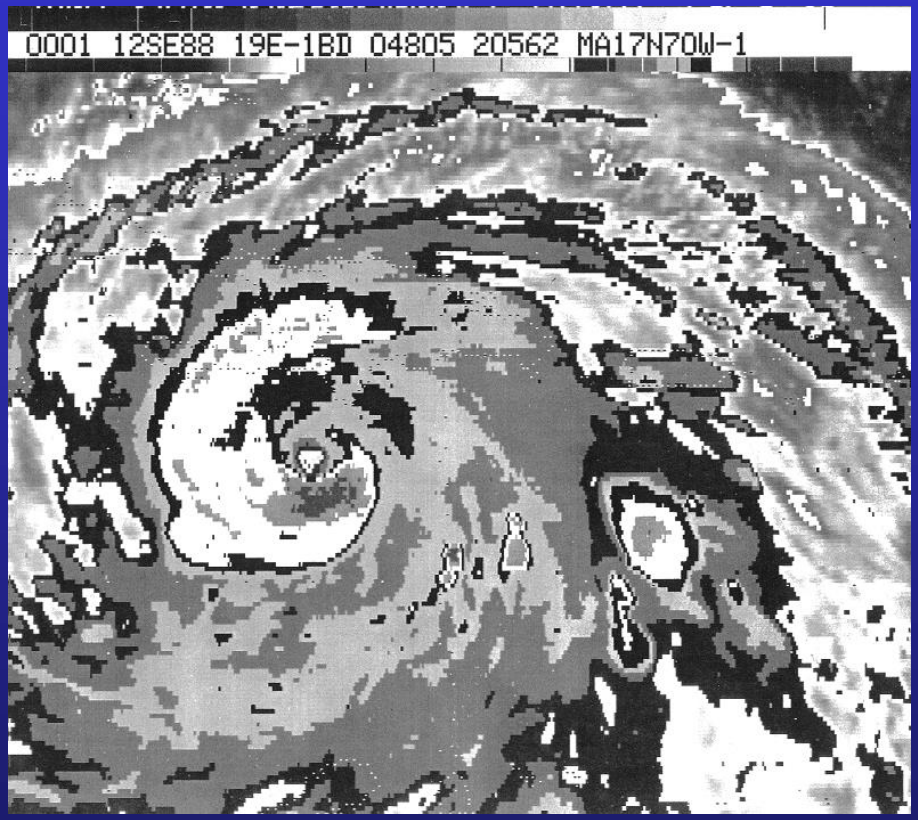
0001 UTC 13 Sep 1988

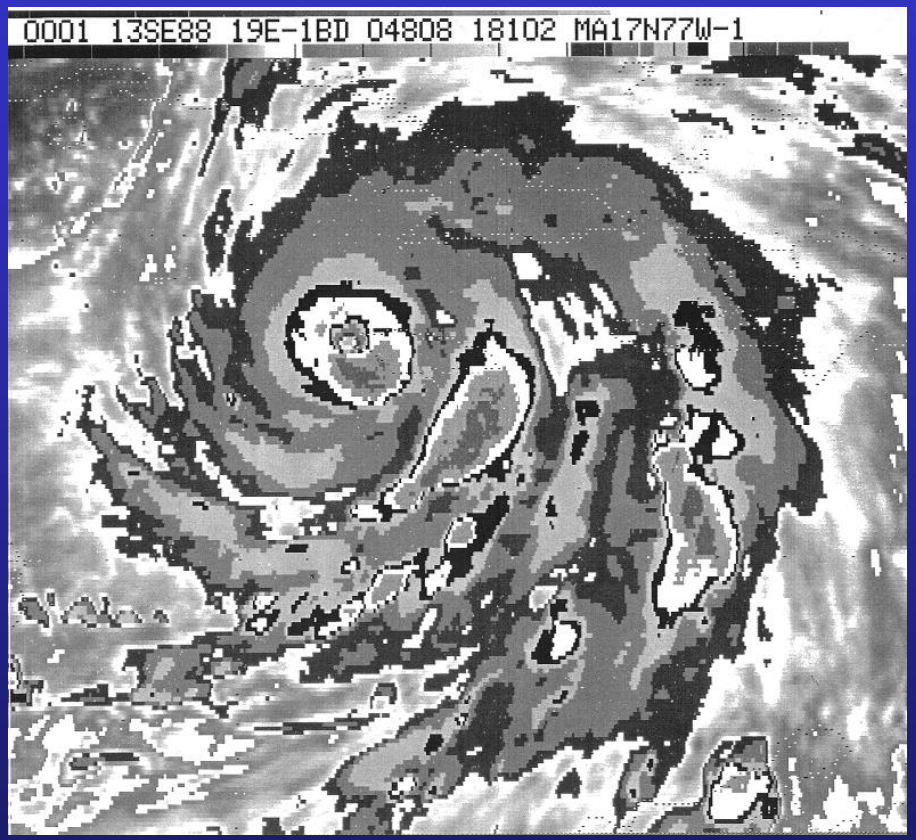


Issues for 0001 UTC 13 Sep 1988

- How has the system changed during the last 24 hours? Any change in development rate?
- The system has passed over Jamaica during the last 12 hours. Should that affect the analysis?
- Is there anything unusual about the eye number and eye adjustment?
- Is there a need for infrared banding?
- What about the PT?

24 hr change?





D+

TROPICAL CYCLONE ANALYSIS WORKSHEET

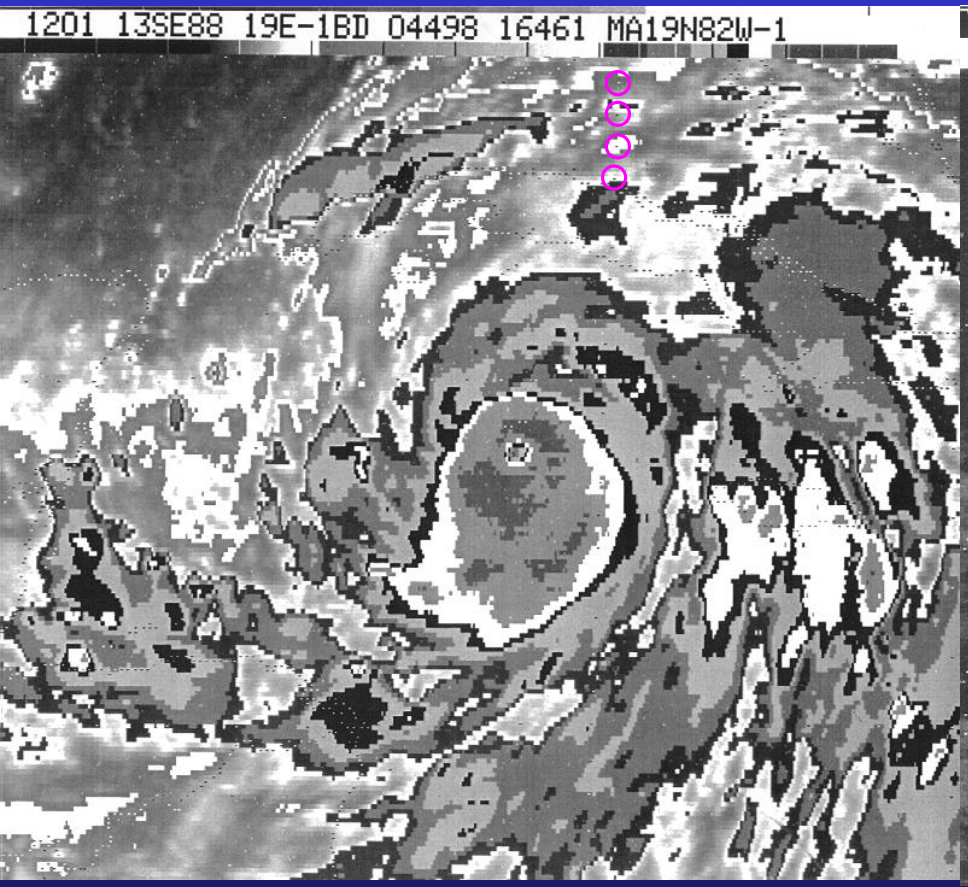
Vernon F. Dvorak
May 1982

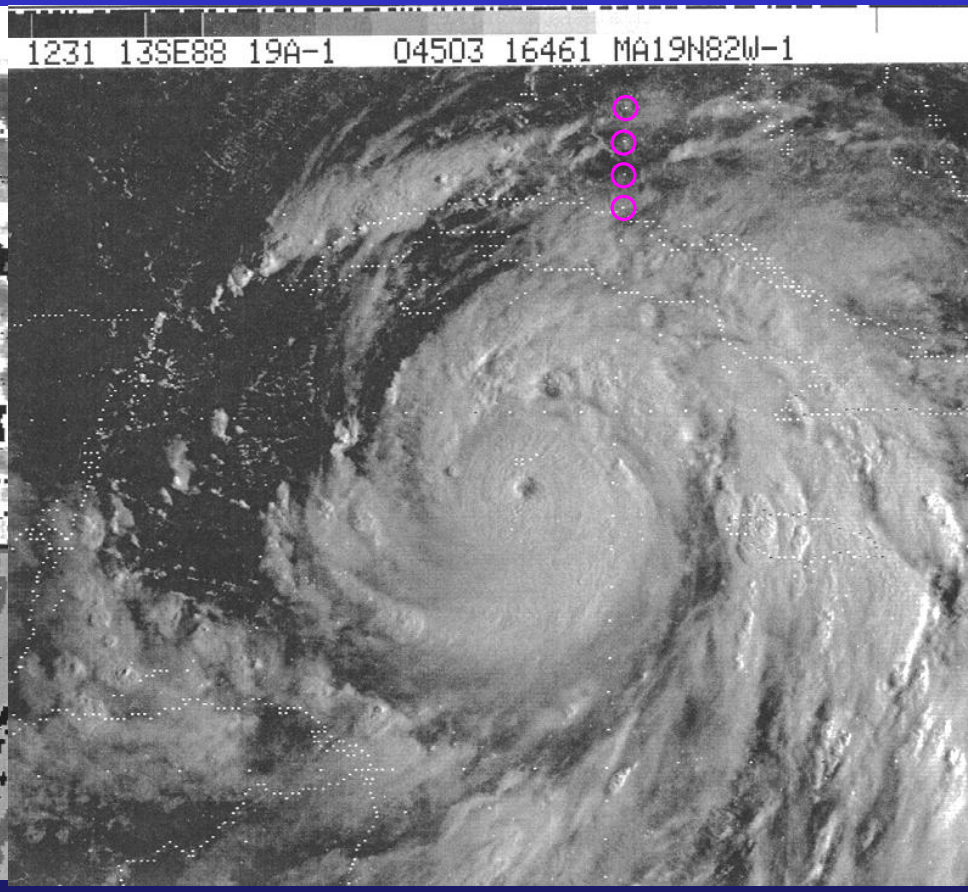
T-NUMBER ESTIMATE FROM MEASUREMENTS FOR DATA T-NUMBER (DT) COMPUTATION

T-NUMBER ESTIMATE FROM MODEL AND DT CONSTRAINTS

STEP →	1		2A,B				2C				2D	2E				3	4	5	6	7,8	9	10		
DESCRIPTION →	Location		Curved Band or Shear				Eye		$E_{No}+E_{Adj}=CF$		CDO	Emb. Centr.	Data T-Number Computation			CCC	Trend	MET	PAT	FT	CI	24-Hr. Fcst.		
RULES →	Locate Cloud System Center at focal point of cloud curvature		Use Spiral Arc Length				(VIS) Use Embedded Distance	(EIR) Use Surrounding Temperature	From Rules	Eye Definition	Use Size	(EIR) Use Surrounding Temperature	CF+BF=DT			Use Rules	24-Hr change	Model Expected T-Number	Pattern T-Number	Use Rules	Current Intensity Number	Adj. Model Fcst. if nec.		INITIALS
			DT 1.5	DT 2.5	DT 3.5	DT 4.5										Central Cold Cover	D-developing W-weakening S-same	Final T-Number				List Rule Used	Forecast Intensity Number	
DATE/TIME	LAT	LONG							E_{No}	E_{Adj}	Central Dense Overcast		CF	BF	DT									
08/1301				0.4											2.5		D	1.0	2.0	1.5	1.5	P	2.5	
08/2301			NO DT - USE RULES														D	1.5	1.5	1.5	1.5	P	2.5	
09/1201		SHEAR	0.8°												2.0		D	2.5	2.0	2.0	2.0	P	2.5	
10/0001				0.65											3.0		D	2.5	3.0	2.5	2.5	P	3.5	
10/1201				0.65											3.0		D	3.0	3.0	3.0	3.0	P	4.0	
10/1201							IRREGULAR				1.5°		2.5+	0.5	3.0+									
11/0001						1.2									4.0		D	3.5	4.5	4.0	4.0	C	5.5	
11/0001			DG EYE IN MG					MG	4.5	-0.5			4.0	0.0	4.0									
11/1101		LG EYE IN LG/W						LG	5.0+	0.0			5.0+	0.0	5.0+		D+	4.5	6.0	4.5	4.5	C	6.0	
11/1101												LG	4.5+	0.0	4.5+									
11/1201							0.5°		4.0	-0.5			3.5	1.0+	4.5+		D+	4.5	5.0	4.5+	4.5+	C	6.0	
11/1201						1.5									4.5									
11/1201							IRREGULAR				2.3°		3.0	1.0+	4.0+									
12/0001			OW EYE IN LG					LG	5.0	0.0			5.0	0.0	5.0		D+	5.5	5.5	5.0	5.0	P	6.0	
12/1131		WMG EYE IN LG/B						LG	5.0	1.0			6.0	0.0	6.0		D+	6.0	5.5	6.0	6.0	C	7.5	
12/1201							0.9°		5.5	0.0			5.5	1.0	6.5		D+	6.0	5.5	6.0	6.0	C	7.5	
13/0001			OW EYE IN B/W					B	5.5+	0.5			6.0+	0.5	6.5+		D+	6.5	6.5	6.5+	6.5+	C	8.0	

1201/1231 UTC 13 Sep 1988

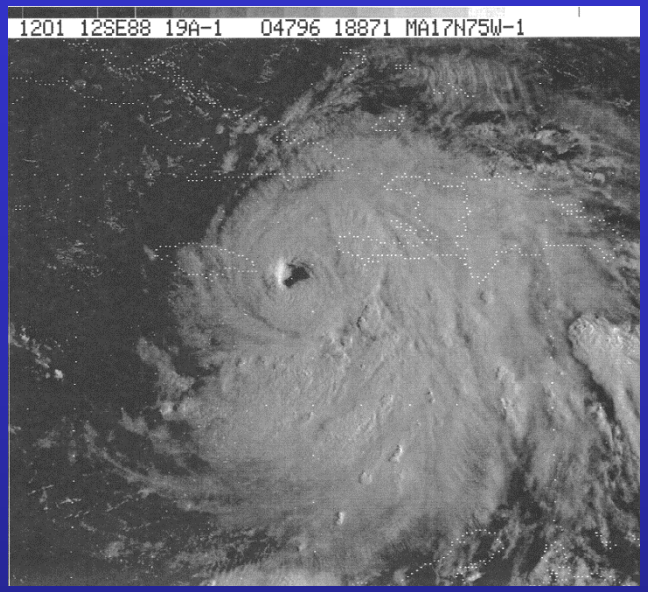


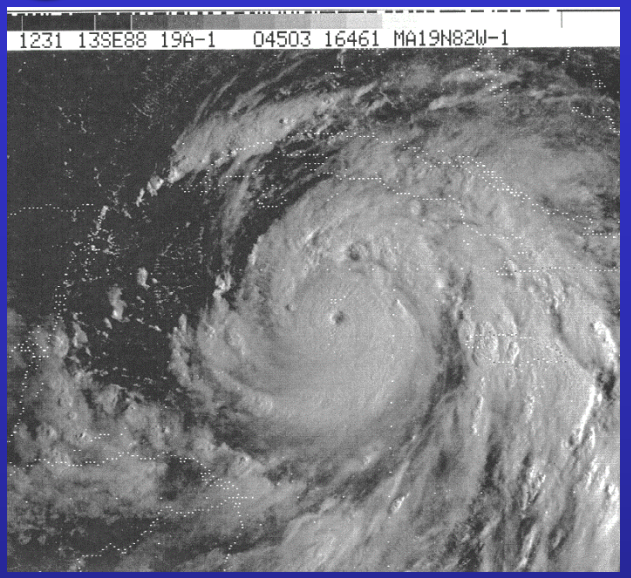


Issues for 1201/1231 UTC 13 Sep 1988

- How has the system changed during the last 24 hours? Any change in development rate?
- Is there anything unusual about the eye number and eye adjustment? How about the eye size? Can we see to the bottom of the eye?
- Is there a need for infrared banding?
- What about the PT?

24 hr change?





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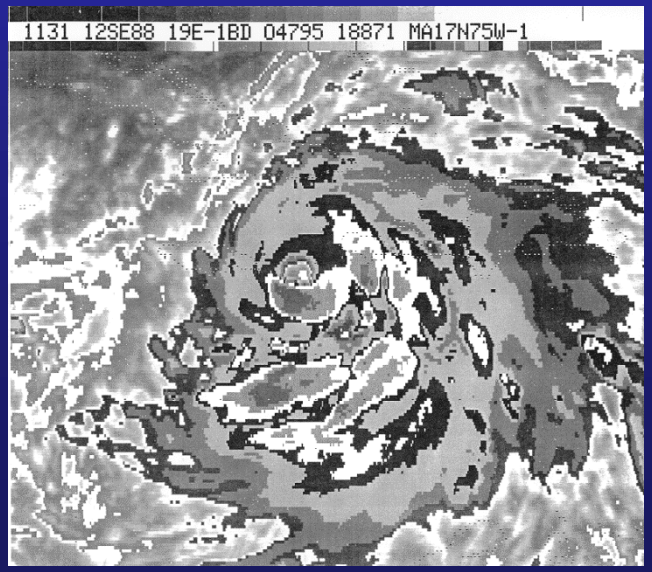
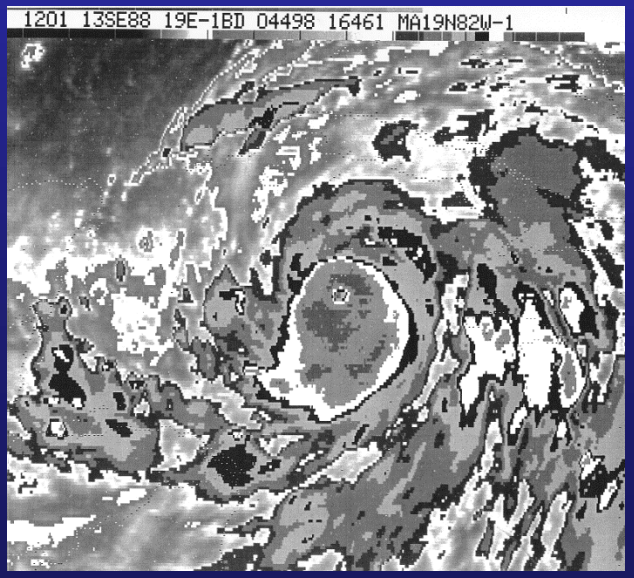




TROPICAL CYCLONE ANALYSIS WORKSHEET

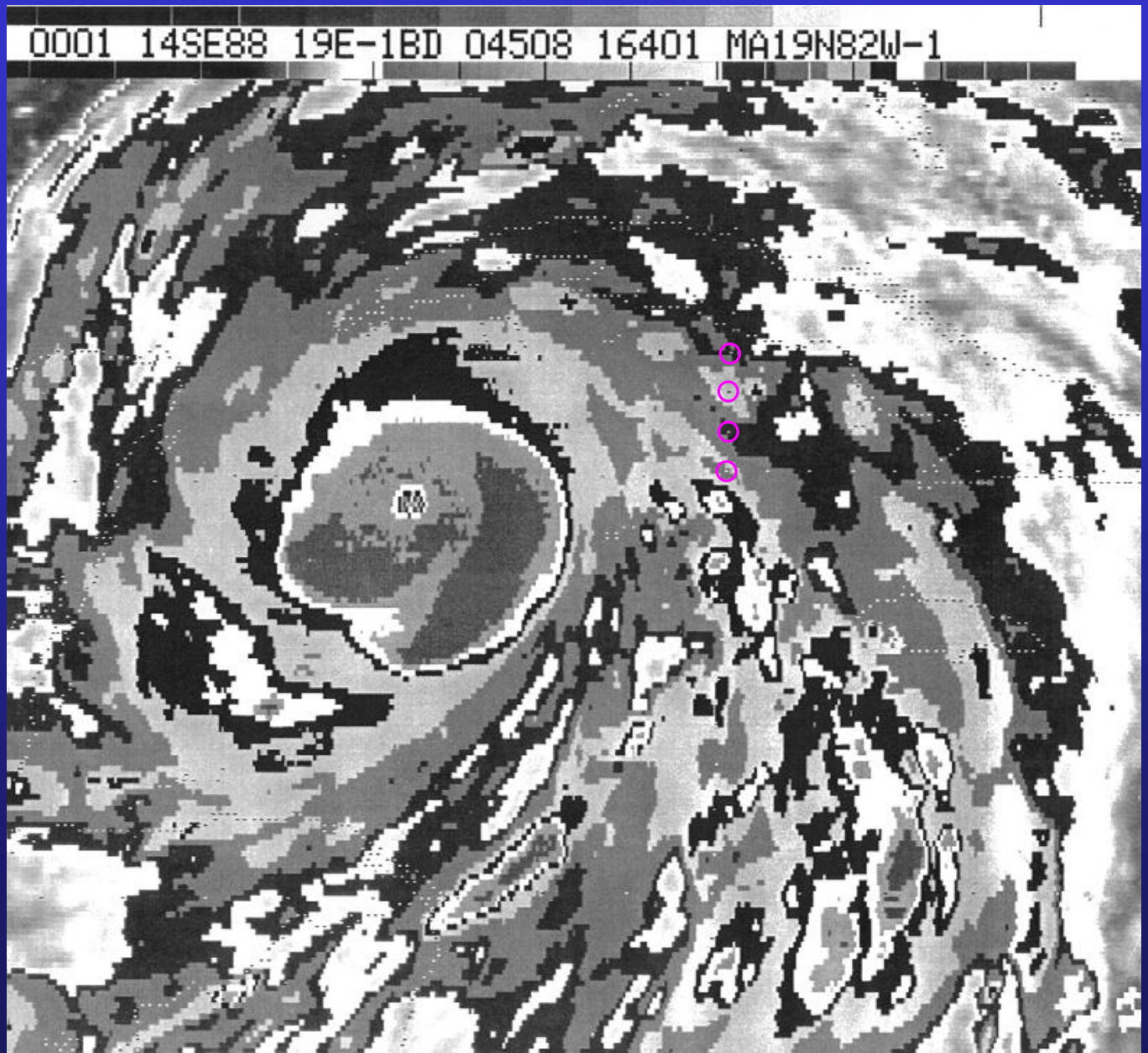
Vernon F. Dvorak
May 1982

T-NUMBER ESTIMATE FROM MEASUREMENTS FOR DATA T-NUMBER (DT) COMPUTATION

T-NUMBER ESTIMATE FROM MODEL AND DT CONSTRAINTS

STEP →	1		2A,B	2C				2D	2E	Data T-Number Computation			3	4	5	6	7,8	9	10		INITIALS
DESCRIPTION →	Location		Curved Band or Shear	Eye		$E_{No}+E_{Adj}=CF$		CDO	Emb. Centr.				CCC	Trend	MET	PAT	FT	CI	24-Hr. Fcst.		
RULES →	Locate Cloud System Center at focal point of cloud curvature		Use Spiral Arc Length DT1.5 DT2.5 DT3.5 DT4.5	(VIS) Use Embedded Distance	(EIR) Use Surrounding Temperature	From Rules	Eye Definition	Use Size Central Dense Overcast	(EIR) Use Surrounding Temperature	CF+BF=DT			Use Rules Central Cold Cover	D-developing W-weakening S-same	Model Expected T-Number	Pattern T-Number	Use Rules Final T-Number	Current Intensity Number	List Rule Used	Adj. Model Fcst. if nec. Forecast Intensity Number	
DATE/TIME	LAT	LONG				E_{No}	E_{Adj}			CF	BF	DT									
08/1301			0.4									2.5		D	1.0	2.0	1.5	1.5	P	2.5	
08/2301			NO DT - USE RULES											D	1.5	1.5	1.5	1.5	P	2.5	
09/1201		SHEAR	0.8°									2.0		D	2.5	2.0	2.0	2.0	P	2.5	
10/0001			0.65									3.0		D	2.5	3.0	2.5	2.5	P	3.5	
10/1201			0.65									3.0		D	3.0	3.0	3.0	3.0	P	4.0	
10/1201				IRREGULAR				1.5°		2.5+	0.5	3.0+									
11/0001			1.2									4.0		D	3.5	4.5	4.0	4.0	C	5.5	
11/0001			DG EYE IN MG		MG	4.5	-0.5			4.0	0.0	4.0									
11/1101			LG EYE IN LG/W		LG	5.0+	0.0			5.0+	0.0	5.0+		D+	4.5	6.0	4.5	4.5	C	6.0	
11/1101									LG	4.5+	0.0	4.5+									
11/1201				0.5°		4.0	-0.5			3.5	1.0+	4.5+		D+	4.5	5.0	4.5+	4.5+	C	6.0	
11/1201			1.5									4.5									
11/1201				IRREGULAR				2.3°		3.0	1.0+	4.0+									
12/0001			OW EYE IN LG		LG	5.0	0.0			5.0	0.0	5.0		D+	5.5	5.5	5.0	5.0	P	6.0	
12/1131			WMG EYE IN LG/B		LG	5.0	1.0			6.0	0.0	6.0		D+	6.0	5.5	6.0	6.0	C	7.5	
12/1201				0.9°		5.5	0.0			5.5	1.0	6.5		D+	6.0	5.5	6.0	6.0	C	7.5	
13/0001			OW EYE IN B/W		B	5.5+	0.5			6.0+	0.5	6.5+		D+	6.5	6.5	6.5+	6.5+	C	8.0	
13/1201			DG EYE IN CMG		CMG	6.5	0.5***			7.0	0.5	7.5		D+	7.5	7.0	7.5	7.5	C	8.0	
13/1231				0.9°		5.5	0.5***			6.0	1.5	7.5		D+	7.5	7.0	7.5	7.5	C	8.0	

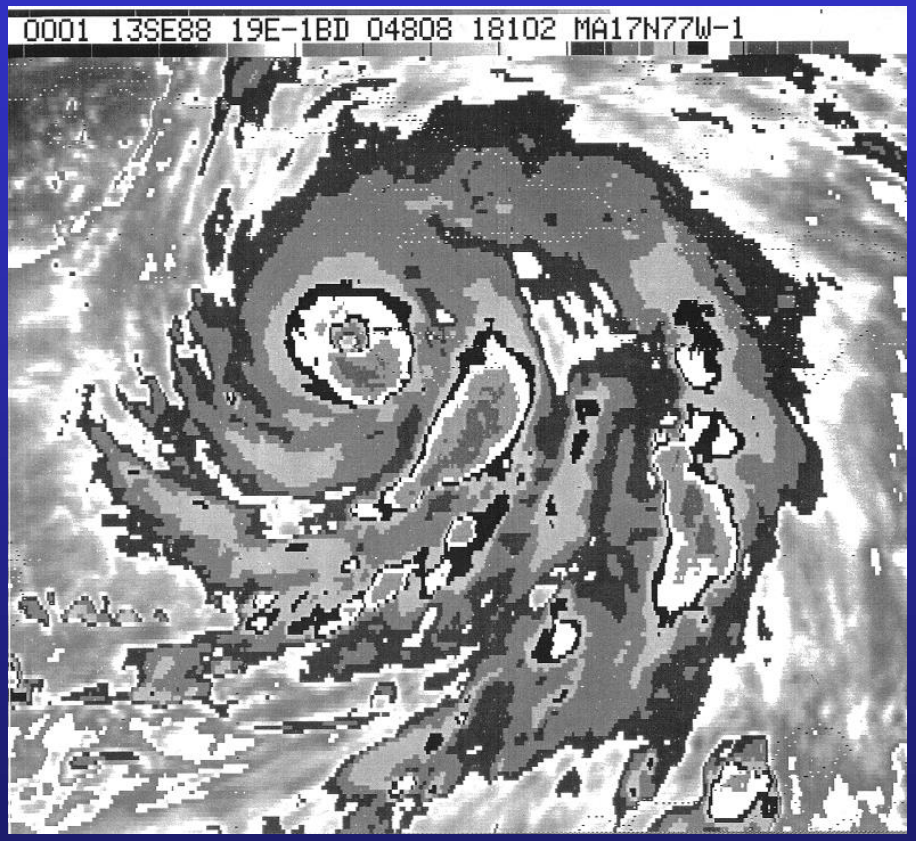
0001 UTC 14 Sep 1988

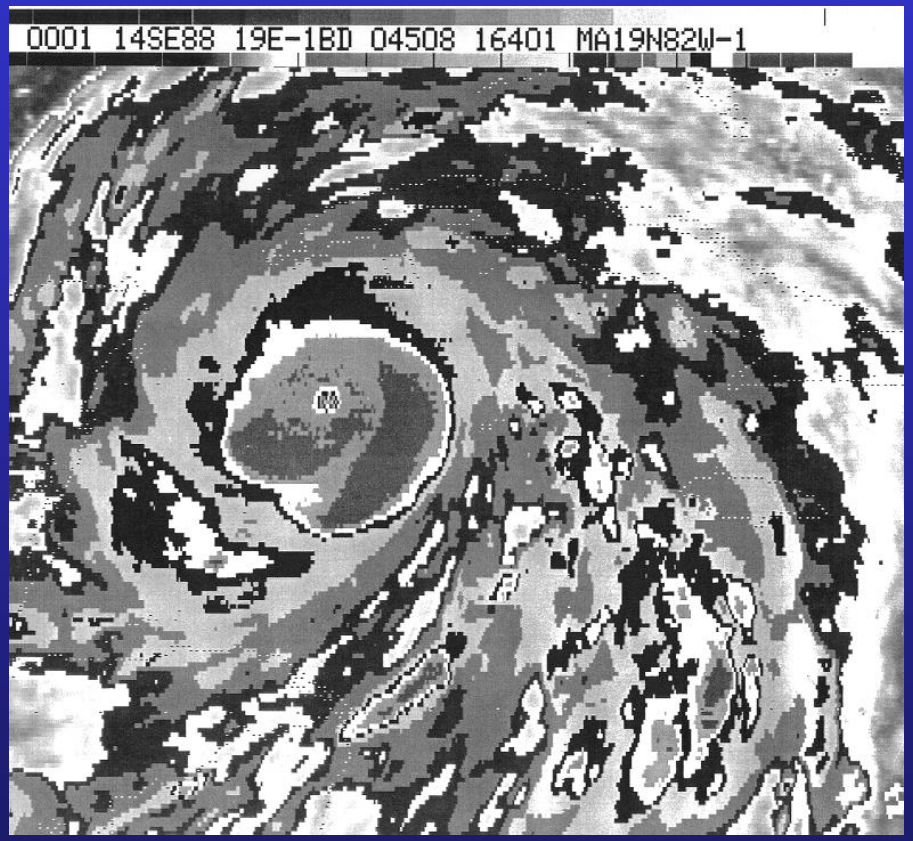


Issues for 0001 UTC 14 Sep 1988

- How has the system changed during the last 24 hours? Any change in development rate?
- Is there anything unusual about the eye number and eye adjustment? How about the eye size? Can we see to the bottom of the eye?
- Is there a need for infrared banding?
- What about the PT? The FI?

24 hr change?





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TROPICAL CYCLONE ANALYSIS WORKSHEET

Vernon F. Dvorak
May 1982

T-NUMBER ESTIMATE FROM MEASUREMENTS FOR DATA T-NUMBER (DT) COMPUTATION

T-NUMBER ESTIMATE FROM MODEL AND DT CONSTRAINTS

STEP →	1		2A,B	2C				2D	2E	Data T-Number Computation			3	4	5	6	7,8	9	10		INITIALS
DESCRIPTION →	Location		Curved Band or Shear	Eye		$E_{No}+E_{Adj}=CF$		CDO	Emb. Centr.				CCC	Trend	MET	PAT	FT	CI	24-Hr. Fcst.		
RULES →	Locate Cloud System Center at focal point of cloud curvature		Use Spiral Arc Length DT1.5 DT2.5 DT3.5 DT4.5	(VIS) Use Embedded Distance	(EIR) Use Surrounding Temperature	From Rules	Eye Definition	Use Size Central Dense Overcast	(EIR) Use Surrounding Temperature	CF+BF=DT			Use Rules Central Cold Cover	D-developing W-weakening S-same	Model Expected T-Number	Pattern T-Number	Use Rules Final T-Number	Current Intensity Number	List Rule Used	Adj. Model Fcst. if nec. Forecast Intensity Number	
DATE/TIME	LAT	LONG				E_{No}	E_{Adj}			CF	BF	DT									
08/1301			0.4									2.5		D	1.0	2.0	1.5	1.5	P	2.5	
08/2301			NO DT - USE RULES											D	1.5	1.5	1.5	1.5	P	2.5	
09/1201		SHEAR	0.8°									2.0		D	2.5	2.0	2.0	2.0	P	2.5	
10/0001			0.65									3.0		D	2.5	3.0	2.5	2.5	P	3.5	
10/1201			0.65									3.0		D	3.0	3.0	3.0	3.0	P	4.0	
10/1201				IRREGULAR				1.5°		2.5+	0.5	3.0+									
11/0001			1.2									4.0		D	3.5	4.5	4.0	4.0	C	5.5	
11/0001			DG EYE IN MG		MG	4.5	-0.5			4.0	0.0	4.0									
11/1101			LG EYE IN LG/W		LG	5.0+	0.0			5.0+	0.0	5.0+		D+	4.5	6.0	4.5	4.5	C	6.0	
11/1101									LG	4.5+	0.0	4.5+									
11/1201				0.5°		4.0	-0.5			3.5	1.0+	4.5+		D+	4.5	5.0	4.5+	4.5+	C	6.0	
11/1201			1.5									4.5									
11/1201				IRREGULAR				2.3°		3.0	1.0+	4.0+									
12/0001			OW EYE IN LG		LG	5.0	0.0			5.0	0.0	5.0		D+	5.5	5.5	5.0	5.0	P	6.0	
12/1131			WMG EYE IN LG/B		LG	5.0	1.0			6.0	0.0	6.0		D+	6.0	5.5	6.0	6.0	C	7.5	
12/1201				0.9°		5.5	0.0			5.5	1.0	6.5		D+	6.0	5.5	6.0	6.0	C	7.5	
13/0001			OW EYE IN B/W		B	5.5+	0.5			6.0+	0.5	6.5+		D+	6.5	6.5	6.5+	6.5+	C	8.0	
13/1201			DG EYE IN CMG		CMG	6.5	0.5***			7.0	0.5	7.5		D+	7.5	7.0	7.5	7.5	C	8.0	
13/1231				0.9°		5.5	0.5***			6.0	1.5	7.5		D+	7.5	7.0	7.5	7.5	C	8.0	

TROPICAL CYCLONE ANALYSIS WORKSHEET

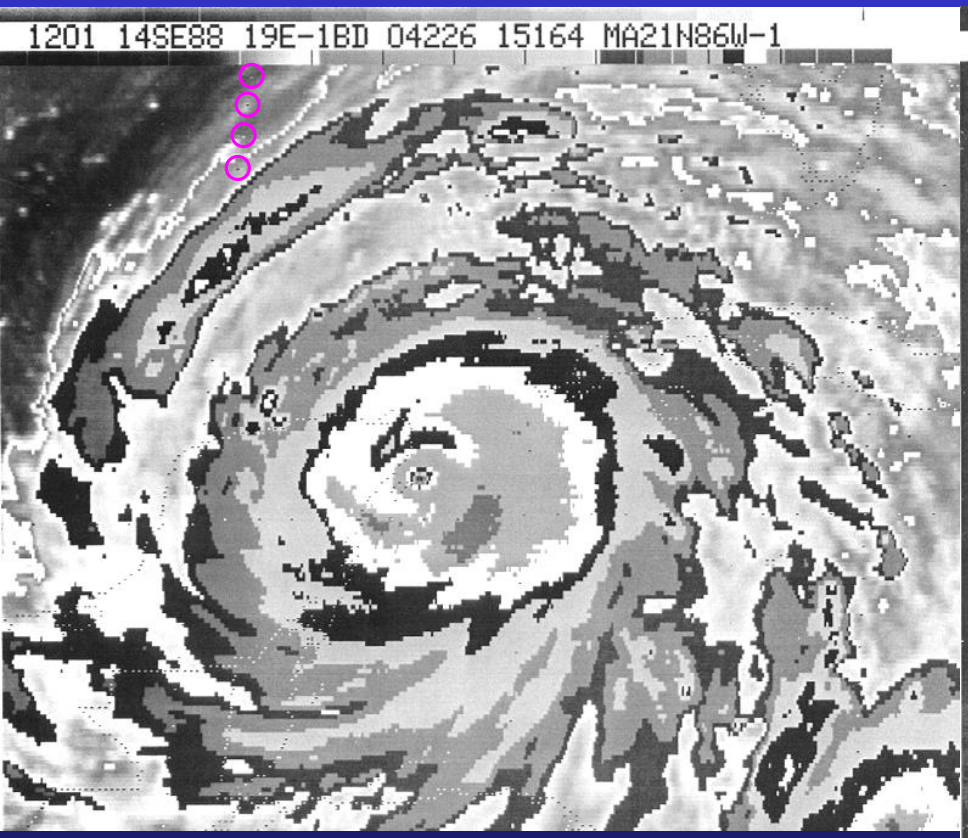
Vernon F. Dvorak
May 1982

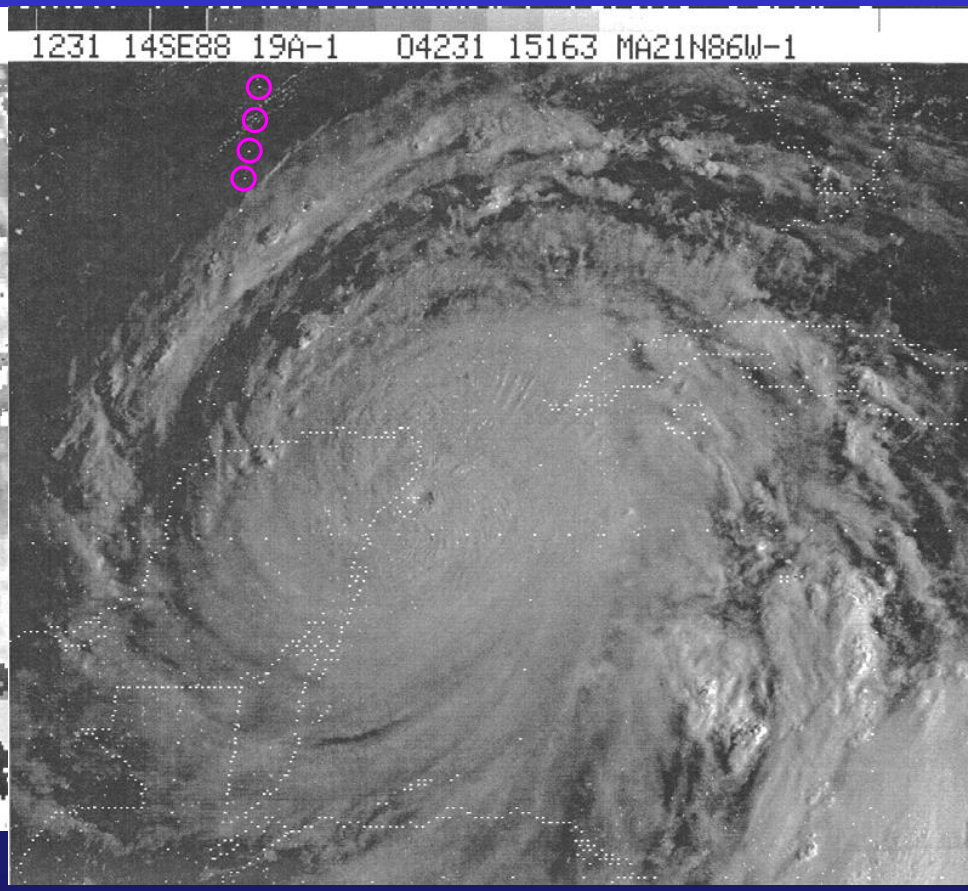
T-NUMBER ESTIMATE FROM MEASUREMENTS FOR DATA T-NUMBER (DT) COMPUTATION

T-NUMBER ESTIMATE FROM MODEL AND DT CONSTRAINTS

STEP →	1		2A,B				2C				2D	2E				3	4	5	6	7,8	9	10		
DESCRIPTION →	Location		Curved Band or Shear				Eye		$E_{No}+E_{Adj}=CF$		CDO	Emb. Centr.	Data T-Number Computation			CCC	Trend	MET	PAT	FT	CI	24-Hr. Fcst.		
RULES →	Locate Cloud System Center at focal point of cloud curvature		Use Spiral Arc Length				(VIS) Use Embedded Distance	(EIR) Use Surrounding Temperature	From Rules	Eye Definition	Use Size	(EIR) Use Surrounding Temperature	CF+BF=DT			Use Rules	24-Hr change			Use Rules		Adj. Model Fcst. if nec.		INITIALS
			DT 1.5	DT 2.5	DT 3.5	DT 4.5					Central Dense Overcast					Central Cold Cover	D-developing W-weakening S-same	Model Expected T-Number	Pattern T-Number	Final T-Number	Current Intensity Number	List Rule Used	Forecast Intensity Number	
DATE/TIME	LAT	LONG							E_{No}	E_{Adj}			CF	BF	DT									
14/0001		WMG EYE IN CMG					CMG		6.5	1.0			7.5	0.5	8.0		D^+	8.0	7.5	8.0	8.0	G?	???	

1201/1231 UTC 14 Sep 1988

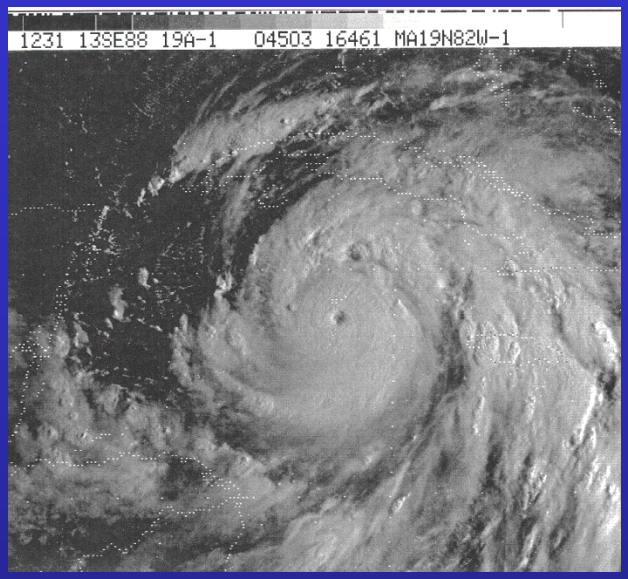


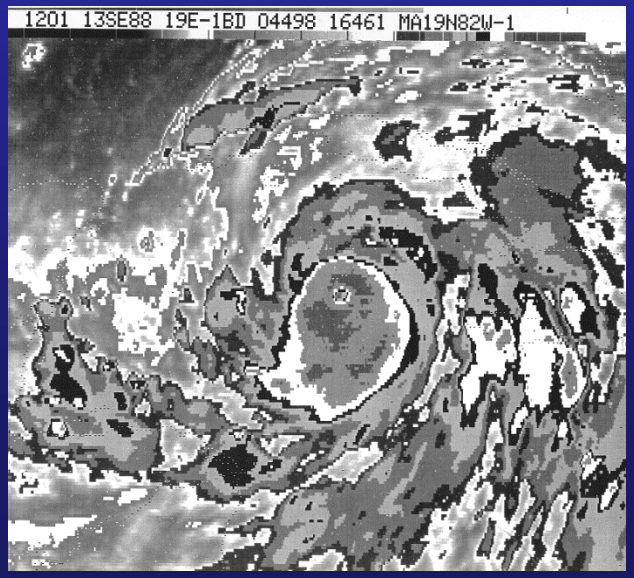


Issues for 1201/1231 UTC 14 Sep 1988

- Is there any change in development trend?
- Is there anything unusual about the eye number and eye adjustment? How about the eye size? Can we see to the bottom of the eye?
- Can IR banding be used?
- What about the PT? The FI?
- What physically might be happening to the storm?

24 hr change?





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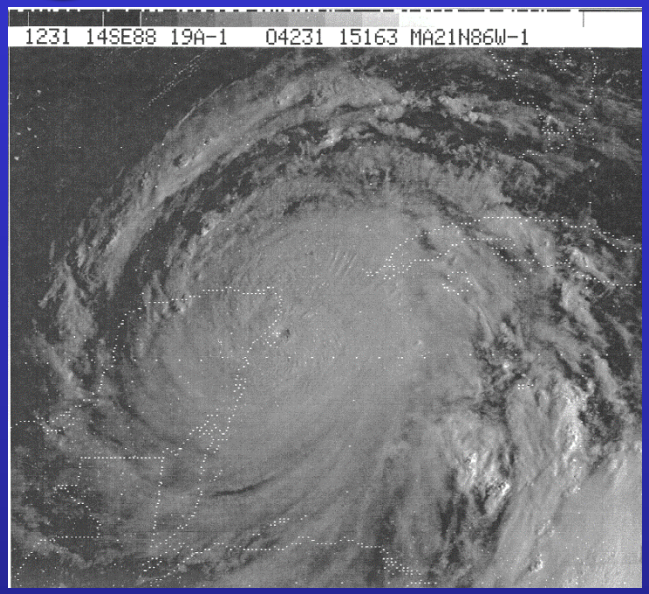
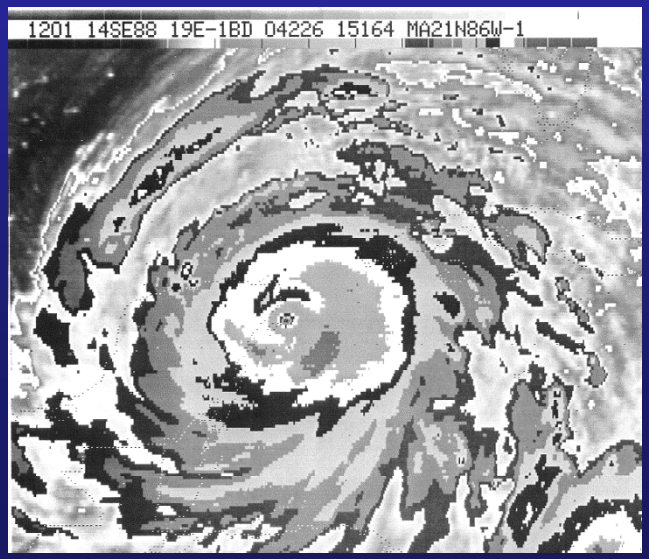




TROPICAL CYCLONE ANALYSIS WORKSHEET

Vernon F. Dvorak
May 1982

T-NUMBER ESTIMATE FROM MEASUREMENTS FOR DATA T-NUMBER (DT) COMPUTATION

T-NUMBER ESTIMATE FROM MODEL AND DT CONSTRAINTS

STEP →	1		2A,B	2C				2D	2E	Data T-Number Computation			3	4	5	6	7,8	9	10		INITIALS
DESCRIPTION →	Location		Curved Band or Shear	Eye		$E_{No}+E_{Adj}=CF$		CDO	Emb. Centr.				CCC	Trend	MET	PAT	FT	CI	24-Hr. Fcst.		
RULES →	Locate Cloud System Center at focal point of cloud curvature		Use Spiral Arc Length DT1.5 DT2.5 DT3.5 DT4.5	(VIS) Use Embedded Distance	(EIR) Use Surrounding Temperature	From Rules	Eye Definition	Use Size Central Dense Overcast	(EIR) Use Surrounding Temperature	CF+BF=DT			Use Rules Central Cold Cover	D-developing W-weakening S-same	Model Expected T-Number	Pattern T-Number	Use Rules Final T-Number	Current Intensity Number	List Rule Used	Adj. Model Fcst. if nec. Forecast Intensity Number	
DATE/TIME	LAT	LONG				E_{No}	E_{Adj}			CF	BF	DT									
08/1301			0.4									2.5		D	1.0	2.0	1.5	1.5	P	2.5	
08/2301			NO DT - USE RULES											D	1.5	1.5	1.5	1.5	P	2.5	
09/1201		SHEAR	0.8°									2.0		D	2.5	2.0	2.0	2.0	P	2.5	
10/0001			0.65									3.0		D	2.5	3.0	2.5	2.5	P	3.5	
10/1201			0.65									3.0		D	3.0	3.0	3.0	3.0	P	4.0	
10/1201				IRREGULAR				1.5°		2.5+	0.5	3.0+									
11/0001			1.2									4.0		D	3.5	4.5	4.0	4.0	C	5.5	
11/0001			DG EYE IN MG		MG	4.5	-0.5			4.0	0.0	4.0									
11/1101			LG EYE IN LG/W		LG	5.0+	0.0			5.0+	0.0	5.0+		D+	4.5	6.0	4.5	4.5	C	6.0	
11/1101									LG	4.5+	0.0	4.5+									
11/1201				0.5°		4.0	-0.5			3.5	1.0+	4.5+		D+	4.5	5.0	4.5+	4.5+	C	6.0	
11/1201			1.5									4.5									
11/1201				IRREGULAR				2.3°		3.0	1.0+	4.0+									
12/0001			OW EYE IN LG		LG	5.0	0.0			5.0	0.0	5.0		D+	5.5	5.5	5.0	5.0	P	6.0	
12/1131			WMG EYE IN LG/B		LG	5.0	1.0			6.0	0.0	6.0		D+	6.0	5.5	6.0	6.0	C	7.5	
12/1201				0.9°		5.5	0.0			5.5	1.0	6.5		D+	6.0	5.5	6.0	6.0	C	7.5	
13/0001			OW EYE IN B/W		B	5.5+	0.5			6.0+	0.5	6.5+		D+	6.5	6.5	6.5+	6.5+	C	8.0	
13/1201			DG EYE IN CMG		CMG	6.5	0.5***			7.0	0.5	7.5		D+	7.5	7.0	7.5	7.5	C	8.0	
13/1231				0.9°		5.5	0.5***			6.0	1.5	7.5		D+	7.5	7.0	7.5	7.5	C	8.0	

TROPICAL CYCLONE ANALYSIS WORKSHEET

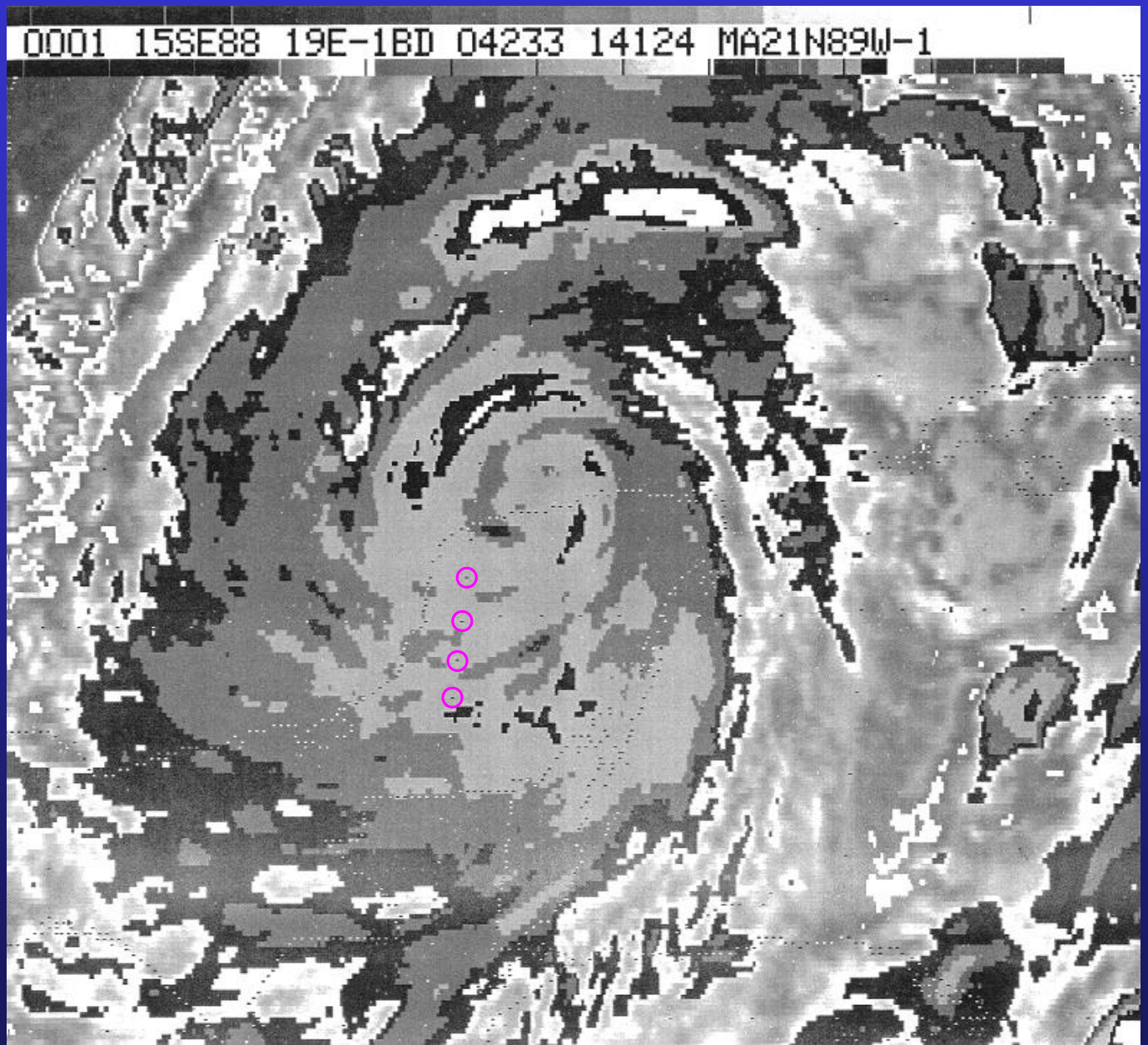
Vernon F. Dvorak
May 1982

T-NUMBER ESTIMATE FROM MEASUREMENTS FOR DATA T-NUMBER (DT) COMPUTATION

T-NUMBER ESTIMATE FROM MODEL AND DT CONSTRAINTS

STEP →	1		2A,B				2C				2D	2E		3	4	5	6	7,8	9	10		
DESCRIPTION →	Location		Curved Band or Shear				Eye		$E_{No}+E_{Adj}=CF$		CDO	Emb. Centr.	Data T-Number Computation	CCC	Trend	MET	PAT	FT	CI	24-Hr. Fcst.		
RULES →	Locate Cloud System Center at focal point of cloud curvature		Use Spiral Arc Length				(VIS) Use Embedded Distance	(EIR) Use Surrounding Temperature	From Rules	Eye Definition	Use Size	(EIR) Use Surrounding Temperature	CF+BF=DT	Use Rules	24-Hr change			Use Rules		Adj. Model Fcst. if nec.		INITIALS
			DT 1.5	DT 2.5	DT 3.5	DT 4.5								Central Cold Cover	D-developing W-weakening S-same	Model Expected T-Number	Pattern T-Number	Final T-Number	Current Intensity Number	List Rule Used	Forecast Intensity Number	
DATE/TIME	LAT	LONG							E_{No}	E_{Adj}	Central Dense Overcast		CF BF DT									
14/0001		WMG EYE IN CMG					CMG		6.5	1.0			7.5 0.5 8.0		D^+	8.0	7.5	8.0	8.0	G?	???	
14/1201		DG EYE IN W/CMG						W	6.0	0.5***			6.5 0.0 6.5		S	7.5	7.0	7.5	8.0	B	???	
14/1231							0.7°		5.0	0.0			5.0 2.0 7.0		S	7.5	7.0	7.5	8.0	B	???	

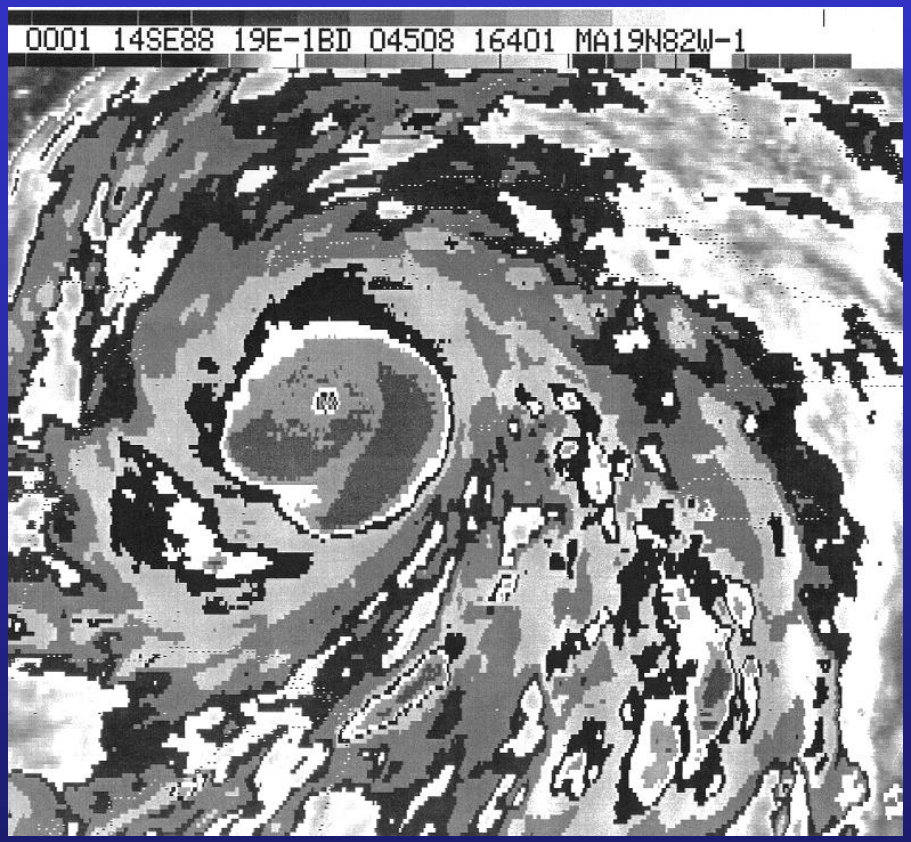
0001 UTC 15 Sep 1988

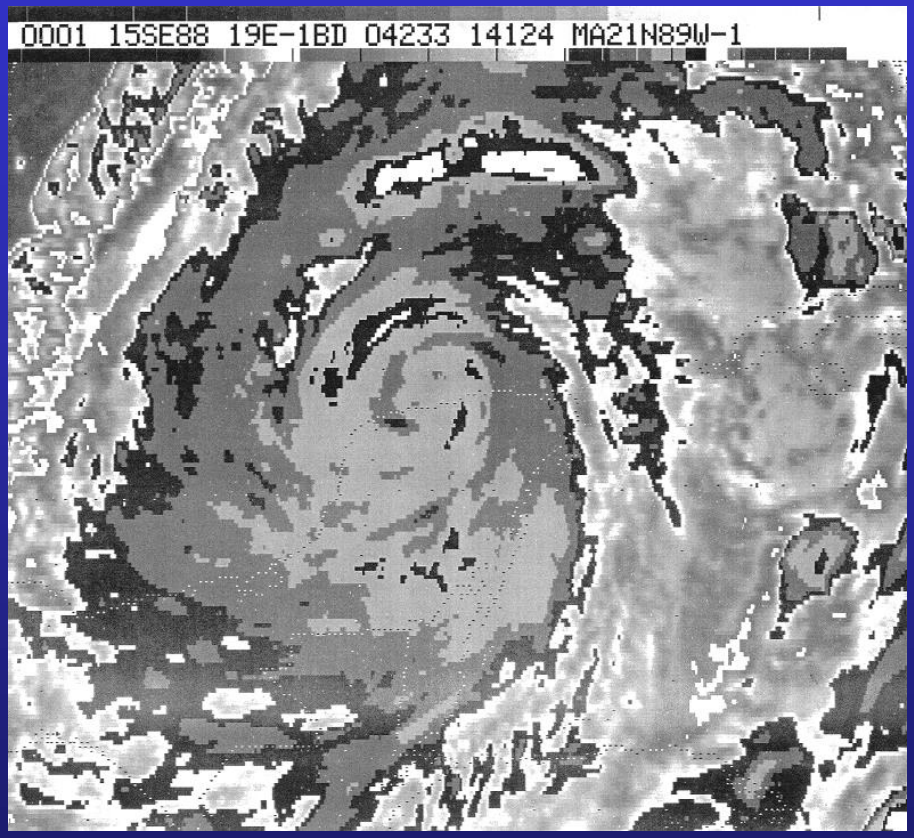


Issues for 0001 UTC 15 Sep 1988

- The hurricane has been over land for most of the last 12 hours. How does this affect the analysis? How does this affect the MET?
- Which cloud pattern could be used for measurements?

24 hr change?





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TROPICAL CYCLONE ANALYSIS WORKSHEET

Vernon F. Dvorak
May 1982

T-NUMBER ESTIMATE FROM MEASUREMENTS FOR DATA T-NUMBER (DT) COMPUTATION

T-NUMBER ESTIMATE FROM MODEL AND DT CONSTRAINTS

STEP →	1		2A,B	2C				2D	2E	Data T-Number Computation			3	4	5	6	7,8	9	10		INITIALS
DESCRIPTION →	Location		Curved Band or Shear	Eye		$E_{No}+E_{Adj}=CF$		CDO	Emb. Centr.				CCC	Trend	MET	PAT	FT	CI	24-Hr. Fcst.		
RULES →	Locate Cloud System Center at focal point of cloud curvature		Use Spiral Arc Length DT1.5 DT2.5 DT3.5 DT4.5	(VIS) Use Embedded Distance	(EIR) Use Surrounding Temperature	From Rules	Eye Definition	Use Size Central Dense Overcast	(EIR) Use Surrounding Temperature	CF+BF=DT			Use Rules Central Cold Cover	D-developing W-weakening S-same	Model Expected T-Number	Pattern T-Number	Use Rules Final T-Number	Current Intensity Number	List Rule Used	Adj. Model Fcst. if nec. Forecast Intensity Number	
DATE/TIME	LAT	LONG				E_{No}	E_{Adj}			CF	BF	DT									
08/1301			0.4									2.5		D	1.0	2.0	1.5	1.5	P	2.5	
08/2301			NO DT - USE RULES											D	1.5	1.5	1.5	1.5	P	2.5	
09/1201		SHEAR	0.8°									2.0		D	2.5	2.0	2.0	2.0	P	2.5	
10/0001			0.65									3.0		D	2.5	3.0	2.5	2.5	P	3.5	
10/1201			0.65									3.0		D	3.0	3.0	3.0	3.0	P	4.0	
10/1201				IRREGULAR				1.5°		2.5+	0.5	3.0+									
11/0001			1.2									4.0		D	3.5	4.5	4.0	4.0	C	5.5	
11/0001			DG EYE IN MG		MG	4.5	-0.5			4.0	0.0	4.0									
11/1101			LG EYE IN LG/W		LG	5.0+	0.0			5.0+	0.0	5.0+		D+	4.5	6.0	4.5	4.5	C	6.0	
11/1101									LG	4.5+	0.0	4.5+									
11/1201				0.5°		4.0	-0.5			3.5	1.0+	4.5+		D+	4.5	5.0	4.5+	4.5+	C	6.0	
11/1201			1.5									4.5									
11/1201				IRREGULAR				2.3°		3.0	1.0+	4.0+									
12/0001			OW EYE IN LG		LG	5.0	0.0			5.0	0.0	5.0		D+	5.5	5.5	5.0	5.0	P	6.0	
12/1131			WMG EYE IN LG/B		LG	5.0	1.0			6.0	0.0	6.0		D+	6.0	5.5	6.0	6.0	C	7.5	
12/1201				0.9°		5.5	0.0			5.5	1.0	6.5		D+	6.0	5.5	6.0	6.0	C	7.5	
13/0001			OW EYE IN B/W		B	5.5+	0.5			6.0+	0.5	6.5+		D+	6.5	6.5	6.5+	6.5+	C	8.0	
13/1201			DG EYE IN CMG		CMG	6.5	0.5***			7.0	0.5	7.5		D+	7.5	7.0	7.5	7.5	C	8.0	
13/1231				0.9°		5.5	0.5***			6.0	1.5	7.5		D+	7.5	7.0	7.5	7.5	C	8.0	

TROPICAL CYCLONE ANALYSIS WORKSHEET

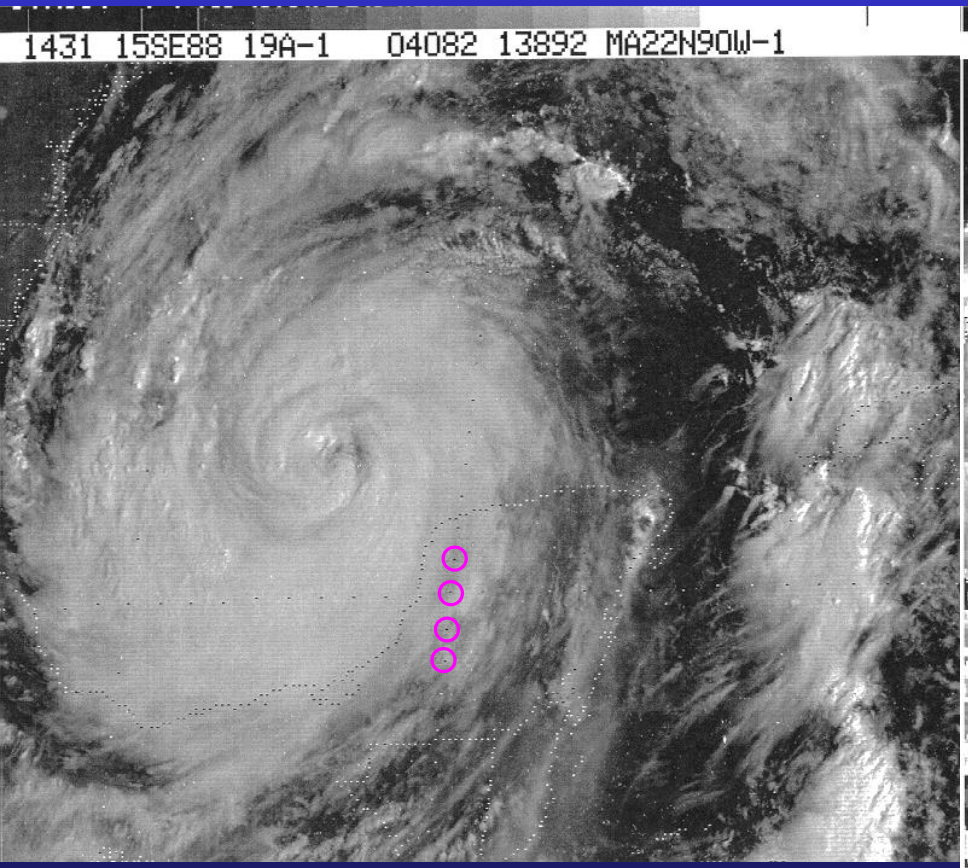
Vernon F. Dvorak
May 1982

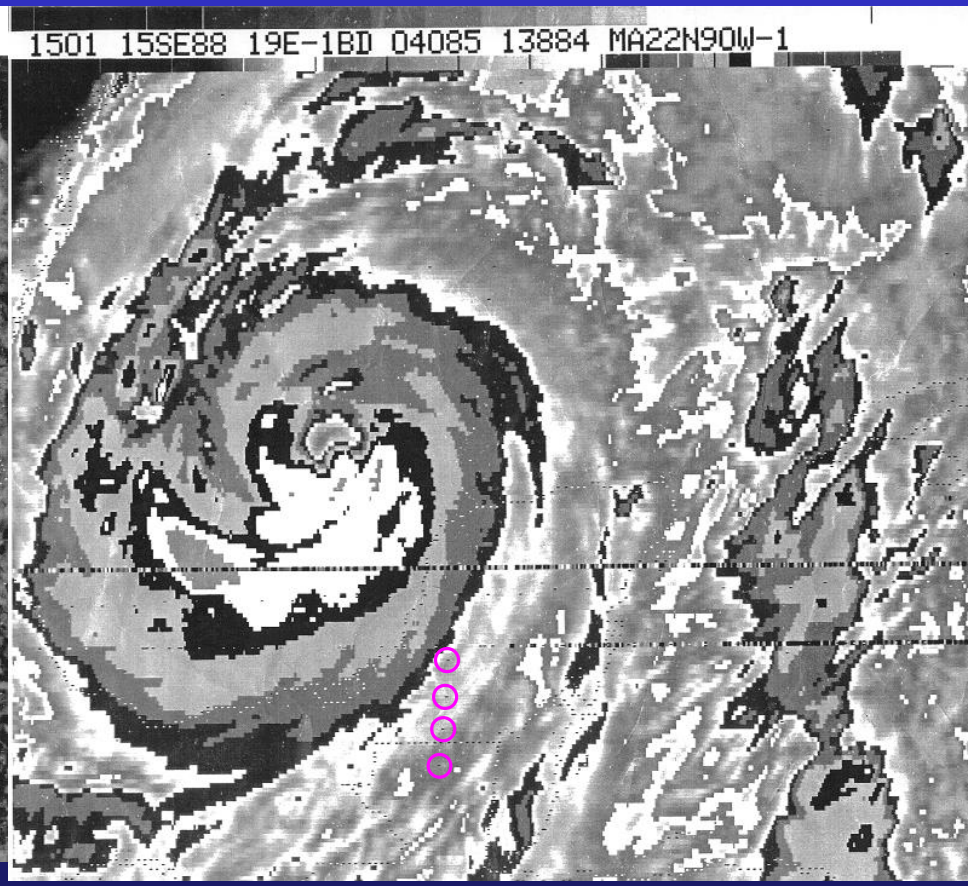
T-NUMBER ESTIMATE FROM MEASUREMENTS FOR DATA T-NUMBER (DT) COMPUTATION

T-NUMBER ESTIMATE FROM MODEL AND DT CONSTRAINTS

STEP →	1		2A,B				2C				2D	2E	Data T-Number Computation			3	4	5	6	7,8	9	10		INITIALS
DESCRIPTION →	Location		Curved Band or Shear				Eye		$E_{No}+E_{Adj}=CF$		CDO	Emb. Centr.				CCC	Trend	MET	PAT	FT	CI	24-Hr. Fcst.		
RULES →	Locate Cloud System Center at focal point of cloud curvature		Use Spiral Arc Length				(VIS) Use Embedded Distance	(EIR) Use Surrounding Temperature	From Rules	Eye Definition	Use Size	(EIR) Use Surrounding Temperature	CF+BF=DT			Use Rules	24-Hr change	Model Expected T-Number	Pattern T-Number	Use Rules	Current Intensity Number	Adj. Model Fcst. if nec.		
			DT 1.5	DT 2.5	DT 3.5	DT 4.5					Central Dense Overcast					Central Cold Cover	D-developing W-weakening S-same			Final T-Number		List Rule Used	Forecast Intensity Number	
DATE/TIME	LAT	LONG							E_{No}	E_{Adj}			CF	BF	DT									
14/0001		WMG EYE IN CMG					CMG		6.5	1.0			7.5	0.5	8.0		D^+	8.0	7.5	8.0	8.0	G?	???	
14/1201		DG EYE IN W/CMG						W	6.0	0.5***			6.5	0.0	6.5		S	7.5	7.0	7.5	8.0	B	???	
14/1231							0.7°		5.0	0.0			5.0	2.0	7.0		S	7.5	7.0	7.5	8.0	B	???	
15/0001												LG	4.5	0.0	4.5		W	5.5	5.0	5.5	6.5	D	7.5	
15/0001						1.2									4.0									

1431/1501 UTC 15 Sep 1988

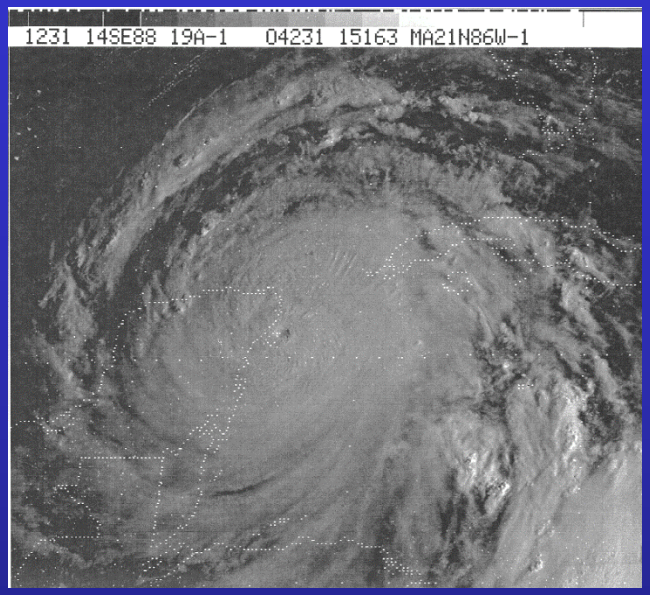


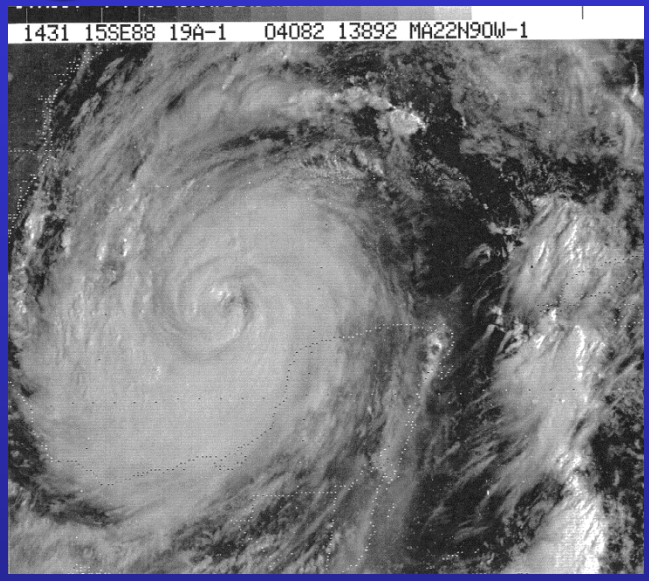


Issues for 1431/1501 UTC 15 Sep 1988

- How has the storm changed in the last 24 hours? Is there any change in development trend?
- What cloud patterns could be used for measurements? Which one might be the best?
- Can IR banding be used here?

24 hr change?





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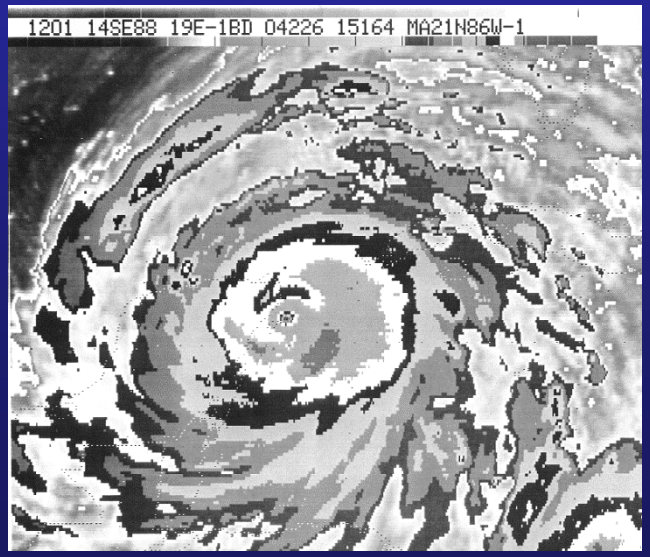
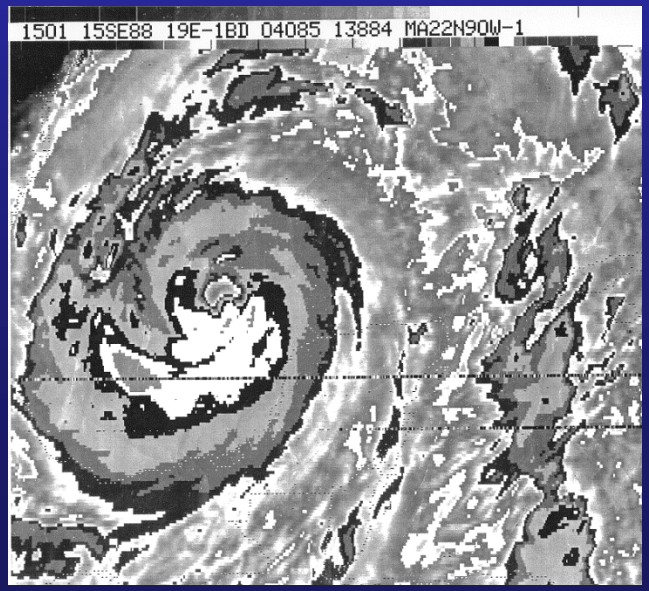




TROPICAL CYCLONE ANALYSIS WORKSHEET

Vernon F. Dvorak
May 1982

T-NUMBER ESTIMATE FROM MEASUREMENTS FOR DATA T-NUMBER (DT) COMPUTATION

T-NUMBER ESTIMATE FROM MODEL AND DT CONSTRAINTS

STEP →	1		2A,B	2C				2D	2E	Data T-Number Computation			3	4	5	6	7,8	9	10		INITIALS
DESCRIPTION →	Location		Curved Band or Shear	Eye		$E_{No}+E_{Adj}=CF$		CDO	Emb. Centr.				CCC	Trend	MET	PAT	FT	CI	24-Hr. Fcst.		
RULES →	Locate Cloud System Center at focal point of cloud curvature		Use Spiral Arc Length DT1.5 DT2.5 DT3.5 DT4.5	(VIS) Use Embedded Distance	(EIR) Use Surrounding Temperature	From Rules	Eye Definition	Use Size Central Dense Overcast	(EIR) Use Surrounding Temperature	CF+BF=DT			Use Rules Central Cold Cover	D-developing W-weakening S-same	Model Expected T-Number	Pattern T-Number	Use Rules Final T-Number	Current Intensity Number	List Rule Used	Adj. Model Fcst. if nec. Forecast Intensity Number	
DATE/TIME	LAT	LONG				E_{No}	E_{Adj}			CF	BF	DT									
08/1301			0.4									2.5		D	1.0	2.0	1.5	1.5	P	2.5	
08/2301			NO DT - USE RULES											D	1.5	1.5	1.5	1.5	P	2.5	
09/1201		SHEAR	0.8°									2.0		D	2.5	2.0	2.0	2.0	P	2.5	
10/0001			0.65									3.0		D	2.5	3.0	2.5	2.5	P	3.5	
10/1201			0.65									3.0		D	3.0	3.0	3.0	3.0	P	4.0	
10/1201				IRREGULAR				1.5°		2.5+	0.5	3.0+									
11/0001			1.2									4.0		D	3.5	4.5	4.0	4.0	C	5.5	
11/0001			DG EYE IN MG		MG	4.5	-0.5			4.0	0.0	4.0									
11/1101			LG EYE IN LG/W		LG	5.0+	0.0			5.0+	0.0	5.0+		D+	4.5	6.0	4.5	4.5	C	6.0	
11/1101									LG	4.5+	0.0	4.5+									
11/1201				0.5°		4.0	-0.5			3.5	1.0+	4.5+		D+	4.5	5.0	4.5+	4.5+	C	6.0	
11/1201			1.5									4.5									
11/1201				IRREGULAR				2.3°		3.0	1.0+	4.0+									
12/0001			OW EYE IN LG		LG	5.0	0.0			5.0	0.0	5.0		D+	5.5	5.5	5.0	5.0	P	6.0	
12/1131			WMG EYE IN LG/B		LG	5.0	1.0			6.0	0.0	6.0		D+	6.0	5.5	6.0	6.0	C	7.5	
12/1201				0.9°		5.5	0.0			5.5	1.0	6.5		D+	6.0	5.5	6.0	6.0	C	7.5	
13/0001			OW EYE IN B/W		B	5.5+	0.5			6.0+	0.5	6.5+		D+	6.5	6.5	6.5+	6.5+	C	8.0	
13/1201			DG EYE IN CMG		CMG	6.5	0.5***			7.0	0.5	7.5		D+	7.5	7.0	7.5	7.5	C	8.0	
13/1231				0.9°		5.5	0.5***			6.0	1.5	7.5		D+	7.5	7.0	7.5	7.5	C	8.0	

TROPICAL CYCLONE ANALYSIS WORKSHEET

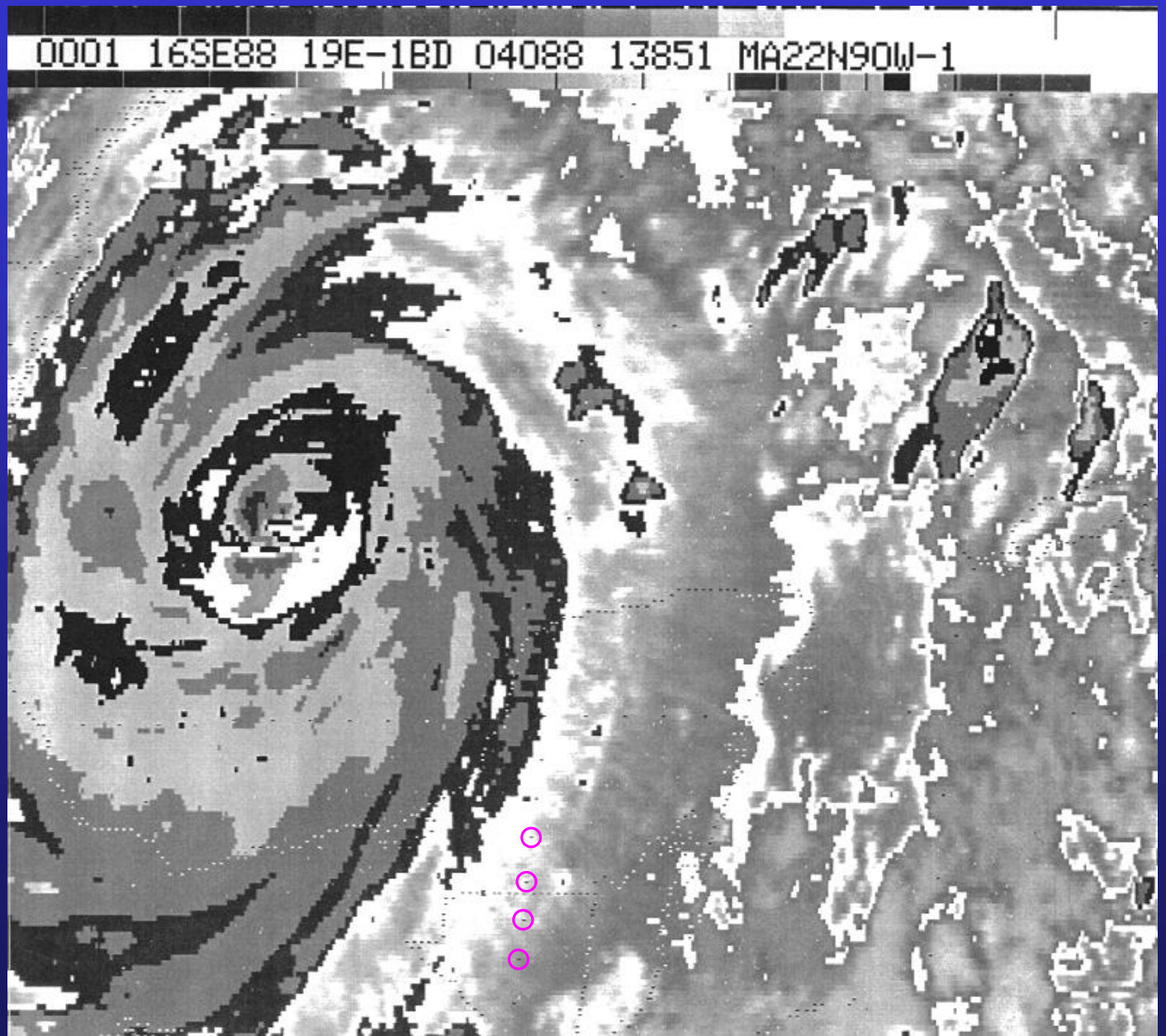
Vernon F. Dvorak
May 1982

T-NUMBER ESTIMATE FROM MEASUREMENTS FOR DATA T-NUMBER (DT) COMPUTATION

T-NUMBER ESTIMATE FROM MODEL AND DT CONSTRAINTS

STEP →	1		2A,B				2C				2D	2E	Data T-Number Computation			3	4	5	6	7,8	9	10		INITIALS
DESCRIPTION →	Location		Curved Band or Shear				Eye		$E_{No}+E_{Adj}=CF$		CDO	Emb. Centr.				CCC	Trend	MET	PAT	FT	CI	24-Hr. Fcst.		
RULES →	Locate Cloud System Center at focal point of cloud curvature		Use Spiral Arc Length				(VIS) Use Embedded Distance	(EIR) Use Surrounding Temperature	From Rules	Eye Definition	Use Size	(EIR) Use Surrounding Temperature	CF+BF=DT			Use Rules	24-Hr change	Model Expected T-Number	Pattern T-Number	Use Rules	Current Intensity Number	Adj. Model Fcst. if nec.		
			DT 1.5	DT 2.5	DT 3.5	DT 4.5					Central Dense Overcast					Central Cold Cover	D-developing W-weakening S-same			Final T-Number		List Rule Used	Forecast Intensity Number	
DATE/TIME	LAT	LONG							E_{No}	E_{Adj}			CF	BF	DT									
14/0001		WMG EYE IN CMG					CMG		6.5	1.0			7.5	0.5	8.0		D^+	8.0	7.5	8.0	8.0	G?	???	
14/1201		DG EYE IN W/CMG						W	6.0	0.5***			6.5	0.0	6.5		S	7.5	7.0	7.5	8.0	B	???	
14/1231							0.7°		5.0	0.0			5.0	2.0	7.0		S	7.5	7.0	7.5	8.0	B	???	
15/0001												LG	4.5	0.0	4.5		W	5.5	5.0	5.5	6.5	D	7.5	
15/0001						1.2									4.0									
15/1431						1.6									4.5		W	4.5	4.5	4.5	5.5	D	6.5	
15/1431							0.5°		4.0	-0.5			3.5	1.5	5.0									
15/1500			OW EYE IN MG					MG	4.5	0.0			4.5	0.0	4.5		W	4.5	4.5	4.5	5.5	D	6.5	

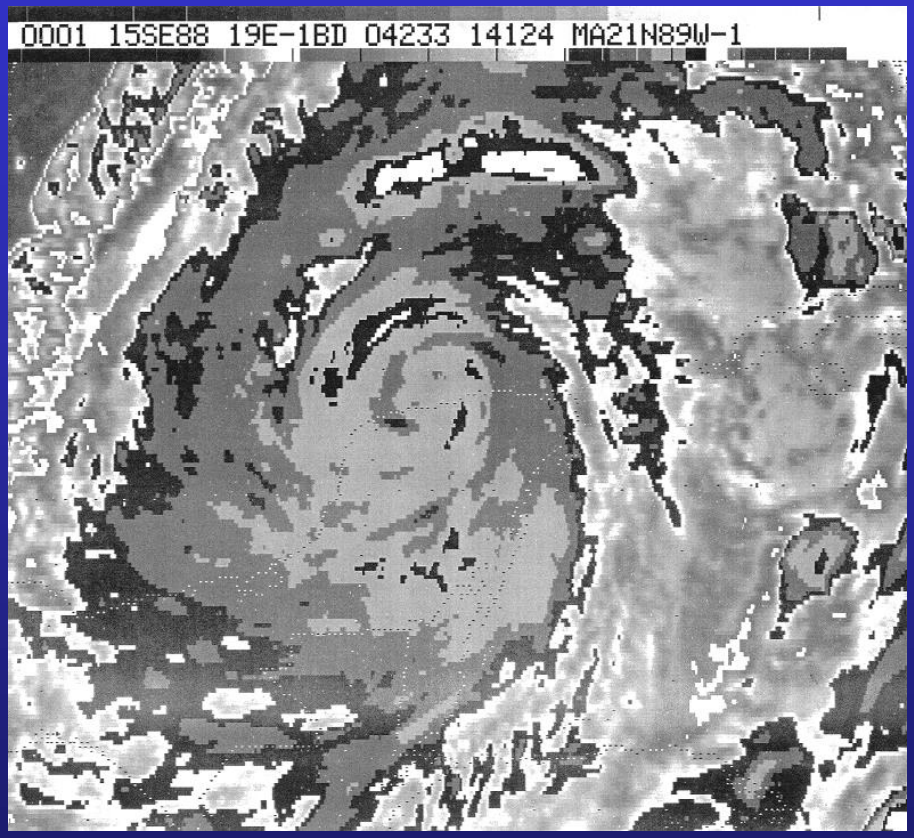
0001 UTC 16 Sep 1988

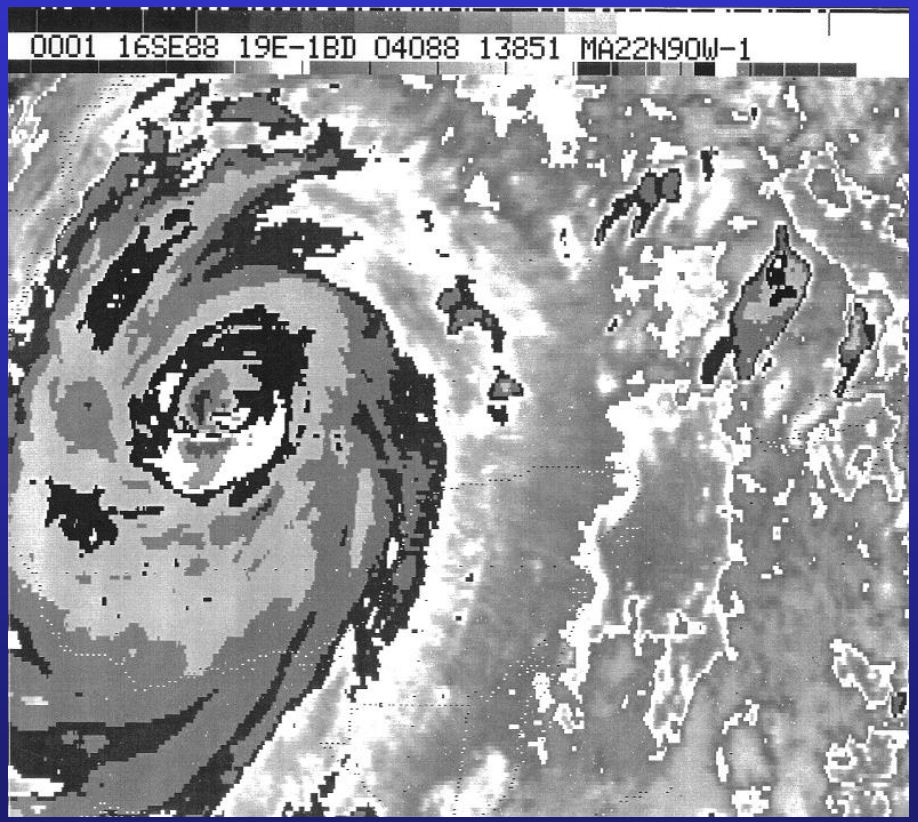


Issues for 0001 UTC 16 Sep 1988

- How has the storm changed in the last 24 hours? Is there any change in development trend?
- What cloud patterns could be used for measurements? Which one might be the best?

24 hr change?





D

TROPICAL CYCLONE ANALYSIS WORKSHEET

Vernon F. Dvorak
May 1982

T-NUMBER ESTIMATE FROM MEASUREMENTS FOR DATA T-NUMBER (DT) COMPUTATION

T-NUMBER ESTIMATE FROM MODEL AND DT CONSTRAINTS

STEP →	1		2A,B	2C				2D	2E	Data T-Number Computation			3	4	5	6	7,8	9	10		INITIALS
DESCRIPTION →	Location		Curved Band or Shear	Eye		$E_{No}+E_{Adj}=CF$		CDO	Emb. Centr.				CCC	Trend	MET	PAT	FT	CI	24-Hr. Fcst.		
RULES →	Locate Cloud System Center at focal point of cloud curvature		Use Spiral Arc Length DT1.5 DT2.5 DT3.5 DT4.5	(VIS) Use Embedded Distance	(EIR) Use Surrounding Temperature	From Rules	Eye Definition	Use Size Central Dense Overcast	(EIR) Use Surrounding Temperature	CF+BF=DT			Use Rules Central Cold Cover	D-developing W-weakening S-same	Model Expected T-Number	Pattern T-Number	Use Rules Final T-Number	Current Intensity Number	List Rule Used	Adj. Model Fcst. if nec. Forecast Intensity Number	
DATE/TIME	LAT	LONG				E_{No}	E_{Adj}			CF	BF	DT									
08/1301			0.4									2.5		D	1.0	2.0	1.5	1.5	P	2.5	
08/2301			NO DT - USE RULES											D	1.5	1.5	1.5	1.5	P	2.5	
09/1201		SHEAR	0.8°									2.0		D	2.5	2.0	2.0	2.0	P	2.5	
10/0001			0.65									3.0		D	2.5	3.0	2.5	2.5	P	3.5	
10/1201			0.65									3.0		D	3.0	3.0	3.0	3.0	P	4.0	
10/1201				IRREGULAR				1.5°		2.5+	0.5	3.0+									
11/0001			1.2									4.0		D	3.5	4.5	4.0	4.0	C	5.5	
11/0001			DG EYE IN MG		MG	4.5	-0.5			4.0	0.0	4.0									
11/1101			LG EYE IN LG/W		LG	5.0+	0.0			5.0+	0.0	5.0+		D+	4.5	6.0	4.5	4.5	C	6.0	
11/1101									LG	4.5+	0.0	4.5+									
11/1201				0.5°		4.0	-0.5			3.5	1.0+	4.5+		D+	4.5	5.0	4.5+	4.5+	C	6.0	
11/1201			1.5									4.5									
11/1201				IRREGULAR				2.3°		3.0	1.0+	4.0+									
12/0001			OW EYE IN LG		LG	5.0	0.0			5.0	0.0	5.0		D+	5.5	5.5	5.0	5.0	P	6.0	
12/1131			WMG EYE IN LG/B		LG	5.0	1.0			6.0	0.0	6.0		D+	6.0	5.5	6.0	6.0	C	7.5	
12/1201				0.9°		5.5	0.0			5.5	1.0	6.5		D+	6.0	5.5	6.0	6.0	C	7.5	
13/0001			OW EYE IN B/W		B	5.5+	0.5			6.0+	0.5	6.5+		D+	6.5	6.5	6.5+	6.5+	C	8.0	
13/1201			DG EYE IN CMG		CMG	6.5	0.5***			7.0	0.5	7.5		D+	7.5	7.0	7.5	7.5	C	8.0	
13/1231				0.9°		5.5	0.5***			6.0	1.5	7.5		D+	7.5	7.0	7.5	7.5	C	8.0	

TROPICAL CYCLONE ANALYSIS WORKSHEET

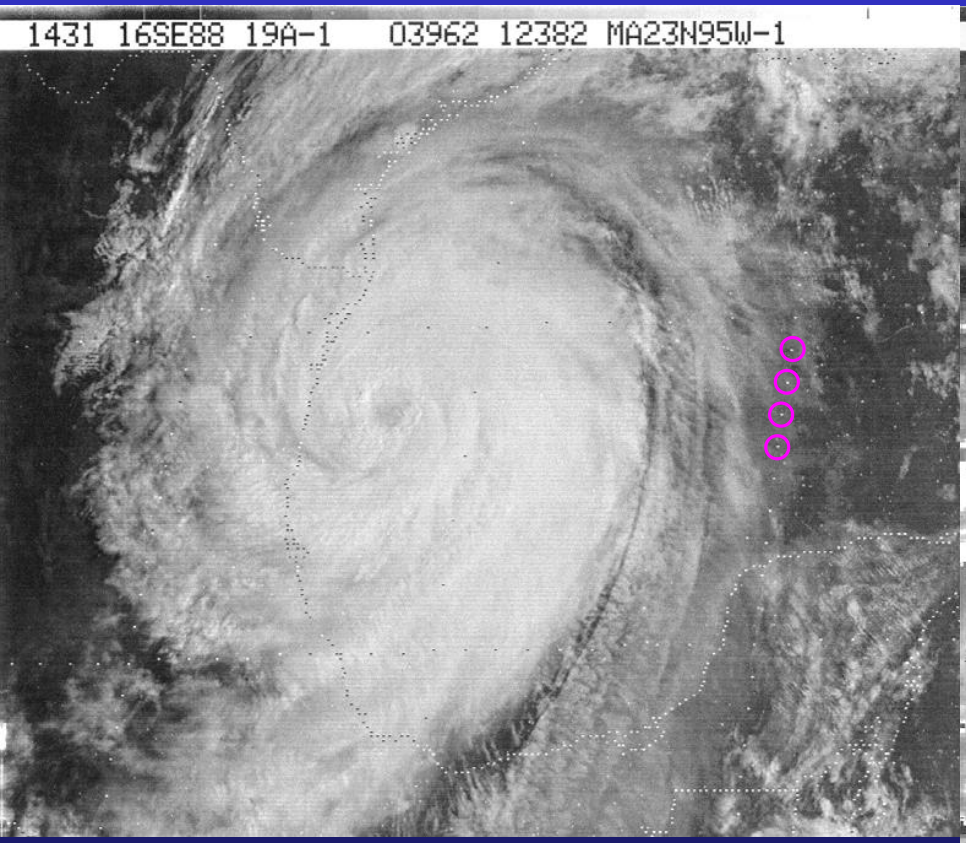
Vernon F. Dvorak
May 1982

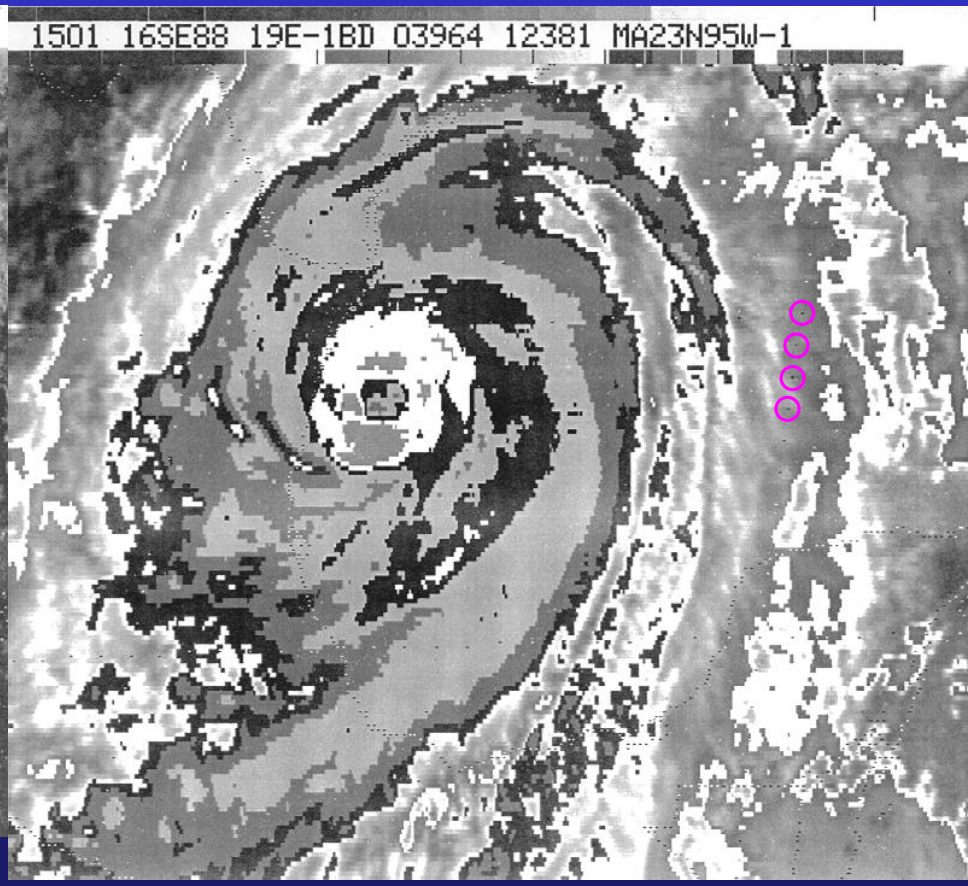
T-NUMBER ESTIMATE FROM MEASUREMENTS FOR DATA T-NUMBER (DT) COMPUTATION

T-NUMBER ESTIMATE FROM MODEL AND DT CONSTRAINTS

STEP →	1		2A,B				2C				2D	2E	Data T-Number Computation			3	4	5	6	7,8	9	10		INITIALS
DESCRIPTION →	Location		Curved Band or Shear				Eye		$E_{No}+E_{Adj}=CF$		CDO	Emb. Centr.				CCC	Trend	MET	PAT	FT	CI	24-Hr. Fcst.		
RULES →	Locate Cloud System Center at focal point of cloud curvature		Use Spiral Arc Length				(VIS) Use Embedded Distance	(EIR) Use Surrounding Temperature	From Rules	Eye Definition	Use Size	(EIR) Use Surrounding Temperature	CF+BF=DT			Use Rules	24-Hr change	Model Expected T-Number	Pattern T-Number	Use Rules	Current Intensity Number	Adj. Model Fcst. if nec.		
DATE/TIME	LAT	LONG	DT 1.5	DT 2.5	DT 3.5	DT 4.5			E_{No}	E_{Adj}	Central Dense Overcast		CF	BF	DT	Central Cold Cover	D-developing W-weakening S-same	Final T-Number		List Rule Used		Forecast Intensity Number	
14/0001		WMG	EYE IN CMG				CMG		6.5	1.0			7.5	0.5	8.0		D^+	8.0	7.5	8.0	8.0	G?	???	
14/1201		DG	EYE IN W/CMG					W	6.0	0.5***			6.5	0.0	6.5		S	7.5	7.0	7.5	8.0	B	???	
14/1231							0.7°		5.0	0.0			5.0	2.0	7.0		S	7.5	7.0	7.5	8.0	B	???	
15/0001												LG	4.5	0.0	4.5		W	5.5	5.0	5.5	6.5	D	7.5	
15/0001						1.2									4.0									
15/1431						1.6									4.5		W	4.5	4.5	4.5	5.5	D	6.5	
15/1431							0.5°		4.0	-0.5			3.5	1.5	5.0									
15/1500			OW	EYE IN MG				MG	4.5	0.0			4.5	0.0	4.5		W	4.5	4.5	4.5	5.5	D	6.5	
16/0001			DG	EYE IN LG/B				LG	5.0^+	0.0			5.0^+	0.0	5.0^+		D	6.5	5.5	5.5	5.5	B	???	

1431/1501 UTC 16 Sep 1988

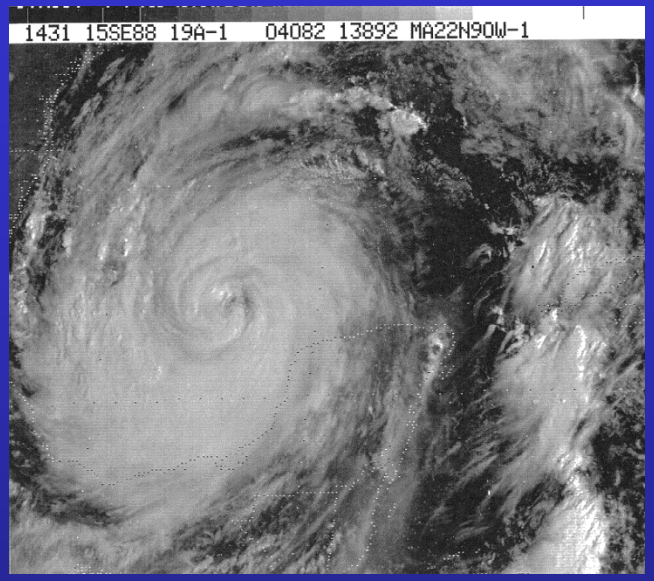


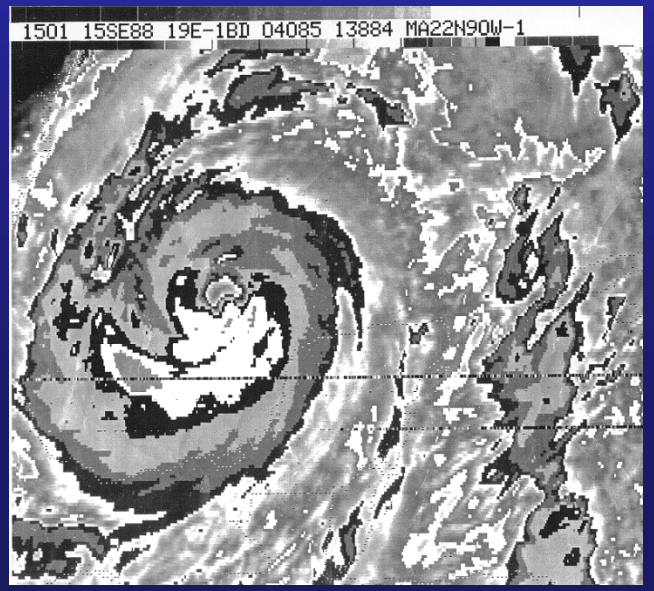


Issues for 1431/1501 UTC 16 Sep 1988

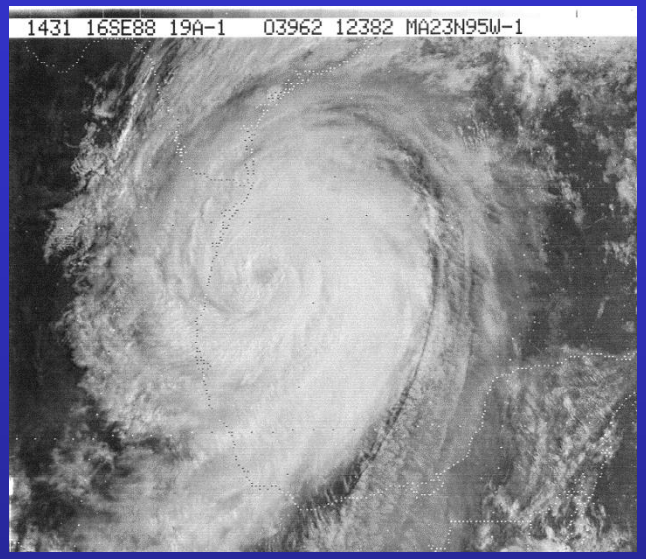
- How has the storm changed in the last 24 hours? Is there any change in development rate or trend?
- What cloud patterns could be used for measurements? Which one might be the best?

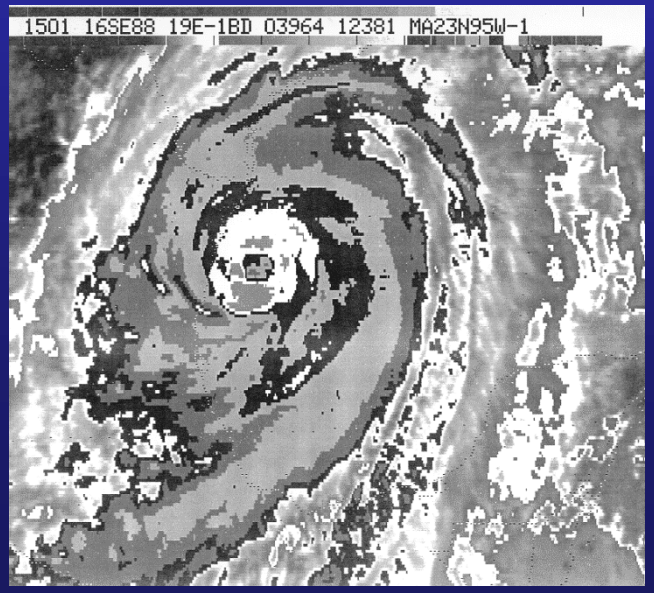
24 hr change?





D





TROPICAL CYCLONE ANALYSIS WORKSHEET

Vernon F. Dvorak
May 1982

T-NUMBER ESTIMATE FROM MEASUREMENTS FOR DATA T-NUMBER (DT) COMPUTATION

T-NUMBER ESTIMATE FROM MODEL AND DT CONSTRAINTS

STEP →	1		2A,B	2C				2D	2E	Data T-Number Computation			3	4	5	6	7,8	9	10		INITIALS
DESCRIPTION →	Location		Curved Band or Shear	Eye		$E_{No}+E_{Adj}=CF$		CDO	Emb. Centr.				CCC	Trend	MET	PAT	FT	CI	24-Hr. Fcst.		
RULES →	Locate Cloud System Center at focal point of cloud curvature		Use Spiral Arc Length DT1.5 DT2.5 DT3.5 DT4.5	(VIS) Use Embedded Distance	(EIR) Use Surrounding Temperature	From Rules	Eye Definition	Use Size Central Dense Overcast	(EIR) Use Surrounding Temperature	CF+BF=DT			Use Rules Central Cold Cover	D-developing W-weakening S-same	Model Expected T-Number	Pattern T-Number	Use Rules Final T-Number	Current Intensity Number	List Rule Used	Forecast Intensity Number	
DATE/TIME	LAT	LONG				E_{No}	E_{Adj}			CF	BF	DT		24-Hr change							
08/1301			0.4									2.5		D	1.0	2.0	1.5	1.5	P	2.5	
08/2301			NO DT - USE RULES											D	1.5	1.5	1.5	1.5	P	2.5	
09/1201		SHEAR	0.8º									2.0		D	2.5	2.0	2.0	2.0	P	2.5	
10/0001			0.65									3.0		D	2.5	3.0	2.5	2.5	P	3.5	
10/1201			0.65									3.0		D	3.0	3.0	3.0	3.0	P	4.0	
10/1201				IRREGULAR				1.5º		2.5+	0.5	3.0+									
11/0001			1.2									4.0		D	3.5	4.5	4.0	4.0	C	5.5	
11/0001			DG EYE IN MG		MG	4.5	-0.5			4.0	0.0	4.0									
11/1101			LG EYE IN LG/W		LG	5.0+	0.0			5.0+	0.0	5.0+		D+	4.5	6.0	4.5	4.5	P	6.0	
11/1101									LG	4.5+	0.0	4.5+									
11/1201				0.5º		4.0	-0.5			3.5	1.0+	4.5+		D+	4.5	5.0	4.5+	4.5+	P	6.0	
11/1201			1.5									4.5									
11/1201				IRREGULAR				2.3º		3.0	1.0+	4.0+									
12/0001			OW EYE IN LG		LG	5.0	0.0			5.0	0.0	5.0		D+	5.5	5.5	5.0	5.0	P	6.0	
12/1131			WMG EYE IN LG/B		LG	5.0	1.0			6.0	0.0	6.0		D+	6.0	5.5	6.0	6.0	P	7.5	
12/1201				0.9º		5.5	0.0			5.5	1.0	6.5		D+	6.0	5.5	6.0	6.0	P	7.5	
13/0001			OW EYE IN B/W		B	5.5+	0.5			6.0+	0.5	6.5+		D+	6.5	6.5	6.5+	6.5+	P	8.0	
13/1201			DG EYE IN CMG		CMG	6.5	0.5***			7.0	0.5	7.5		D+	7.5	7.0	7.5	7.5	P	8.0	
13/1231				0.9º		5.5	0.5***			6.0	1.5	7.5		D+	7.5	7.0	7.5	7.5	P	8.0	

TROPICAL CYCLONE ANALYSIS WORKSHEET

Vernon F. Dvorak
May 1982

T-NUMBER ESTIMATE FROM MEASUREMENTS FOR DATA T-NUMBER (DT) COMPUTATION

T-NUMBER ESTIMATE FROM MODEL AND DT CONSTRAINTS

STEP →	1		2A,B				2C				2D	2E	Data T-Number Computation			3	4	5	6	7,8	9	10		INITIALS
DESCRIPTION →	Location		Curved Band or Shear				Eye		$E_{No}+E_{Adj}=CF$		CDO	Emb. Centr.				CCC	Trend	MET	PAT	FT	CI	24-Hr. Fcst.		
RULES →	Locate Cloud System Center at focal point of cloud curvature		Use Spiral Arc Length				(VIS) Use Embedded Distance	(EIR) Use Surrounding Temperature			Use Size	(EIR) Use Surrounding Temperature	CF+BF=DT			Use Rules	24-Hr change			Use Rules		Adj. Model Fcst. if nec.		
DATE/TIME	LAT	LONG	DT 1.5	DT 2.5	DT 3.5	DT 4.5			From Rules E_{No}	Eye Definition E_{Adj}	Central Dense Overcast		CF	BF	DT	Central Cold Cover	D-developing W-weakening S-same	Model Expected T-Number	Pattern T-Number	Final T-Number	Current Intensity Number	List Rule Used	Forecast Intensity Number	
14/0001		WMG	EYE IN CMG				CMG		6.5	1.0			7.5	0.5	8.0		D^+	8.0	7.5	8.0	8.0	G?	???	
14/1201		DG	EYE IN W/CMG					W	6.0	0.5***			6.5	0.0	6.5		S	7.5	7.0	7.5	8.0	B	???	
14/1231							0.7°		5.0	0.0			5.0	2.0	7.0		S	7.5	7.0	7.5	8.0	B	???	
15/0001												LG	4.5	0.0	4.5		W	5.5	5.0	5.5	6.5	D	7.5	
15/0001						1.2									4.0									
15/1431						1.6									4.5		W	4.5	4.5	4.5	5.5	D	6.5	
15/1431							0.5°		4.0	-0.5			3.5	1.5	5.0									
15/1500			OW	EYE IN MG				MG	4.5	0.0			4.5	0.0	4.5		W	4.5	4.5	4.5	5.5	D	6.5	
16/0001		DG	EYE IN LG/B					LG	5.0^+	0.0			5.0^+	0.0	5.0^+		D	6.5	5.5	5.5	5.5	B	???	
16/1431							0.75°		5.0	-1.0			4.0	1.5^+	5.5^+		D	5.5	6.0	6.0	6.0	B	???	
16/1501			MG	EYE IN W				W	6.0	0.0			6.0	0.0	6.0		D	5.5	6.0	6.0	6.0	B	???	

What storm was this?

Hurricane Gilbert, September 1988