국가기상위성센터
National Meteorological Satellite Center

Current status of COMS AMV in KMA/NMSC

E.J. CHA, H.K. JEONG, E.H. SOHN, S.J. RYU
Satellite Analysis Division
National Meteorological Satellite Center
Korea Meteorological Administration

Contents

1. Introduction

2. Application for Operational Forecast

3. Current Research Activity

4. Summary & Future Plan

1. Introduction Perspective

* Historical Perspective of AMV

1. 2000 : Introduction of algorithm from JMA(GMS data, Terascan SW)

2. 2003~2007 : Development of CMDPS
(COMS Meteorological Data Processing System)
Basic algorithm from EUMETSAT(Holmlund, 1998)

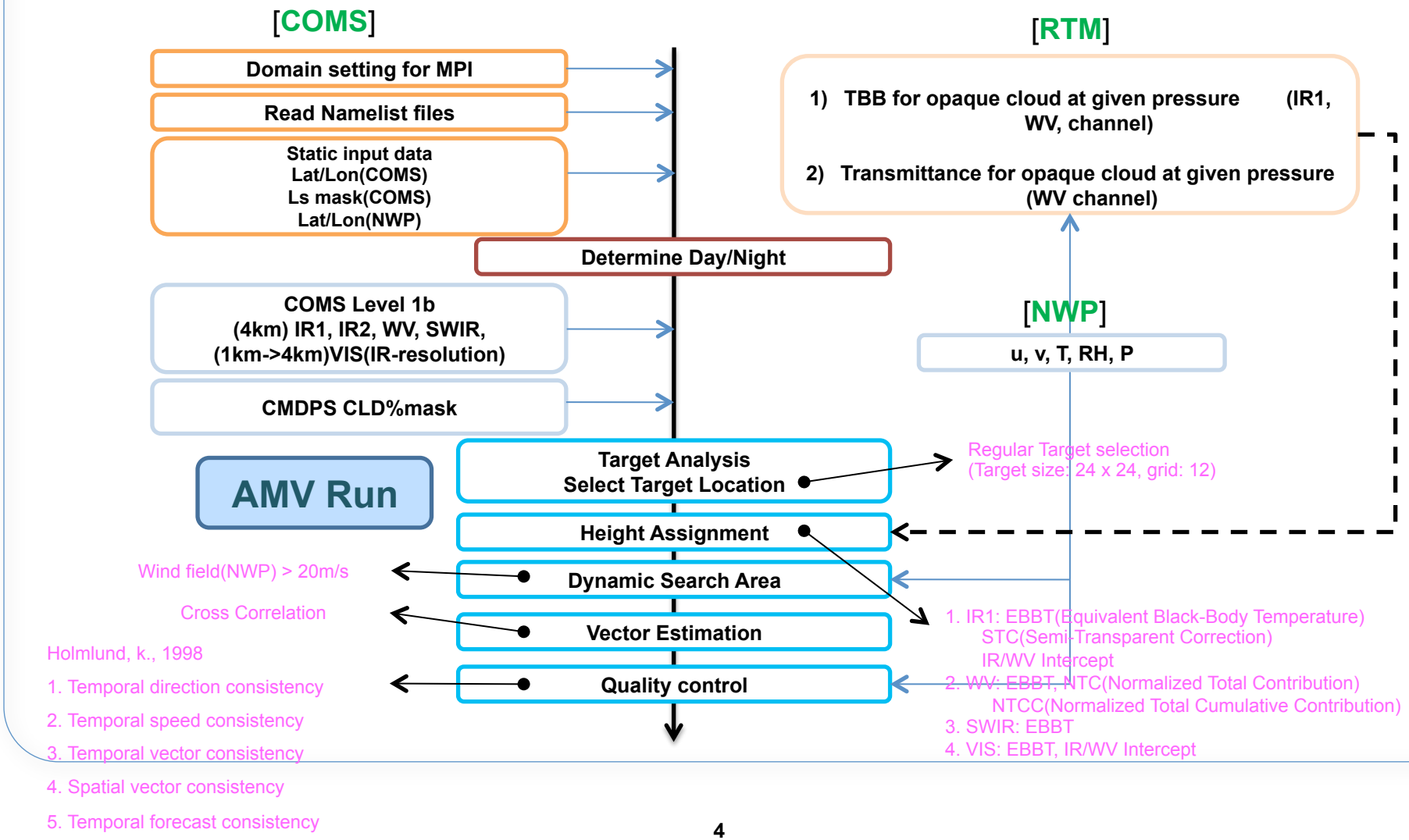
3. 2011 : Operational service
- 4 channel : IR(10.8), WV(6.75), SWIR(3.75) VIS(0.65)
- 29~30 times/daily

4. Dec. 2011 : Use for KMA NWP data assimilation

5. 2014 : Distribute via GTS
(ongoing process with JMA)

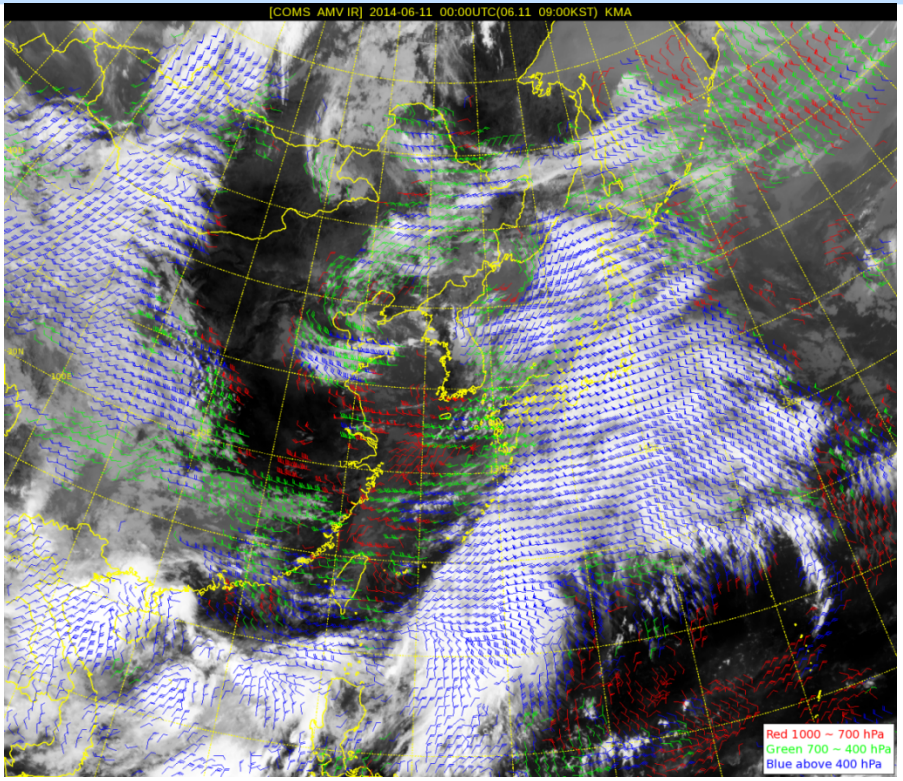
2. Application for Operational Forecast

* Process of COMS AMV

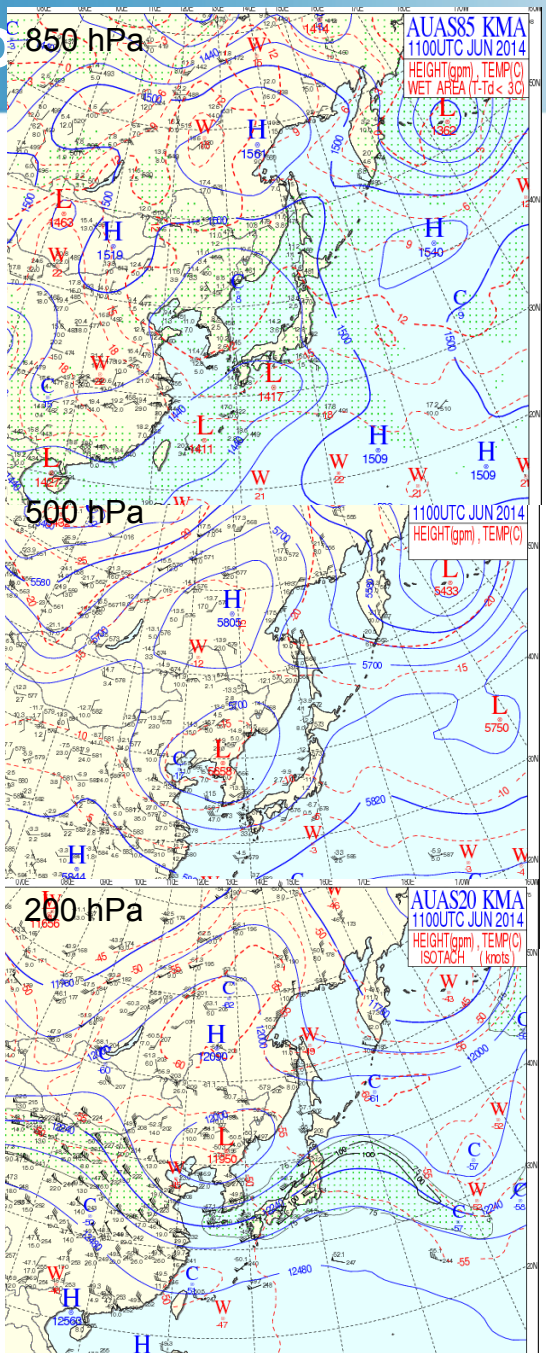


2. Application for Operatio

*** Example of COMS AMV IR1(10.8)**
- 00UTC 11 June 2014 -



- Red : 1000~700 hPa
- Green : 700~400 hPa
- Blue : above 400 hPa

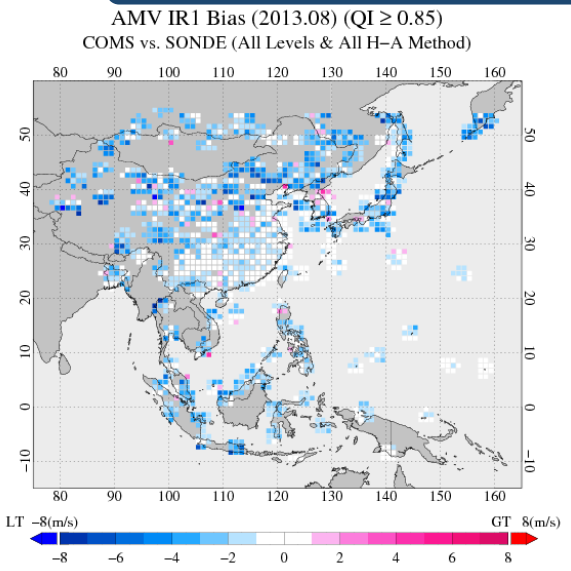


2. Application for Operational Forecast

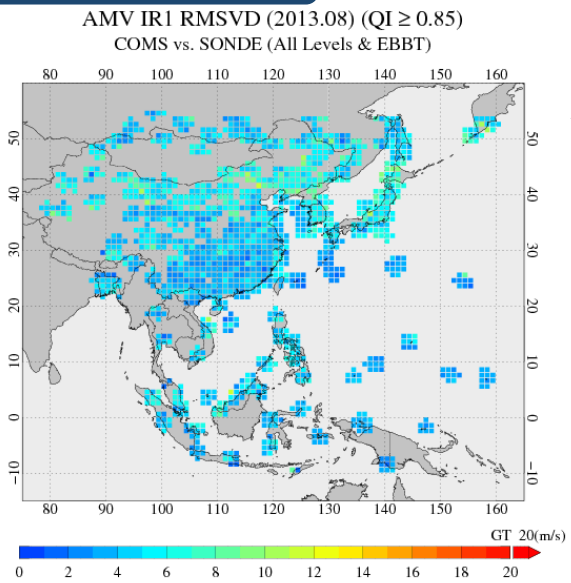
- Example of Product validation & Quality Monitoring web site

Statistical Result Map

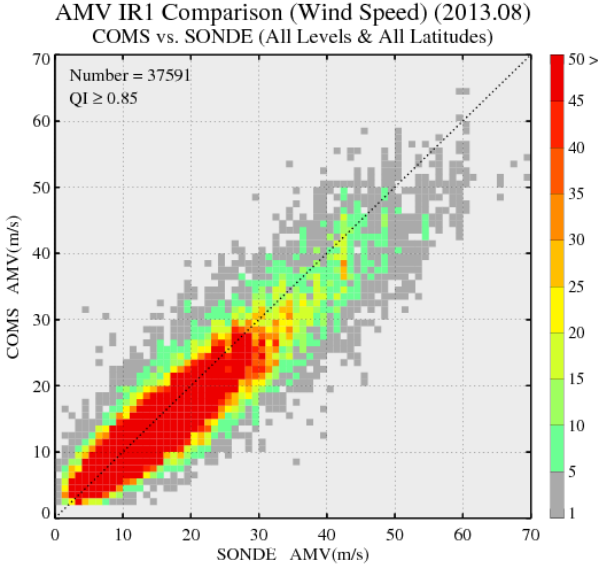
AMV IR1 Bias



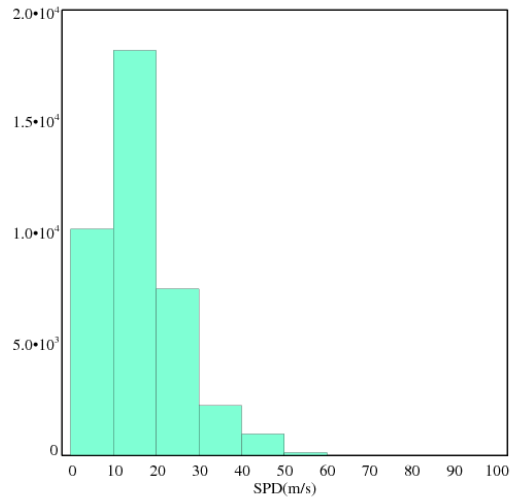
AMV IR1 RMSVD



AMV IR1 Density Plot

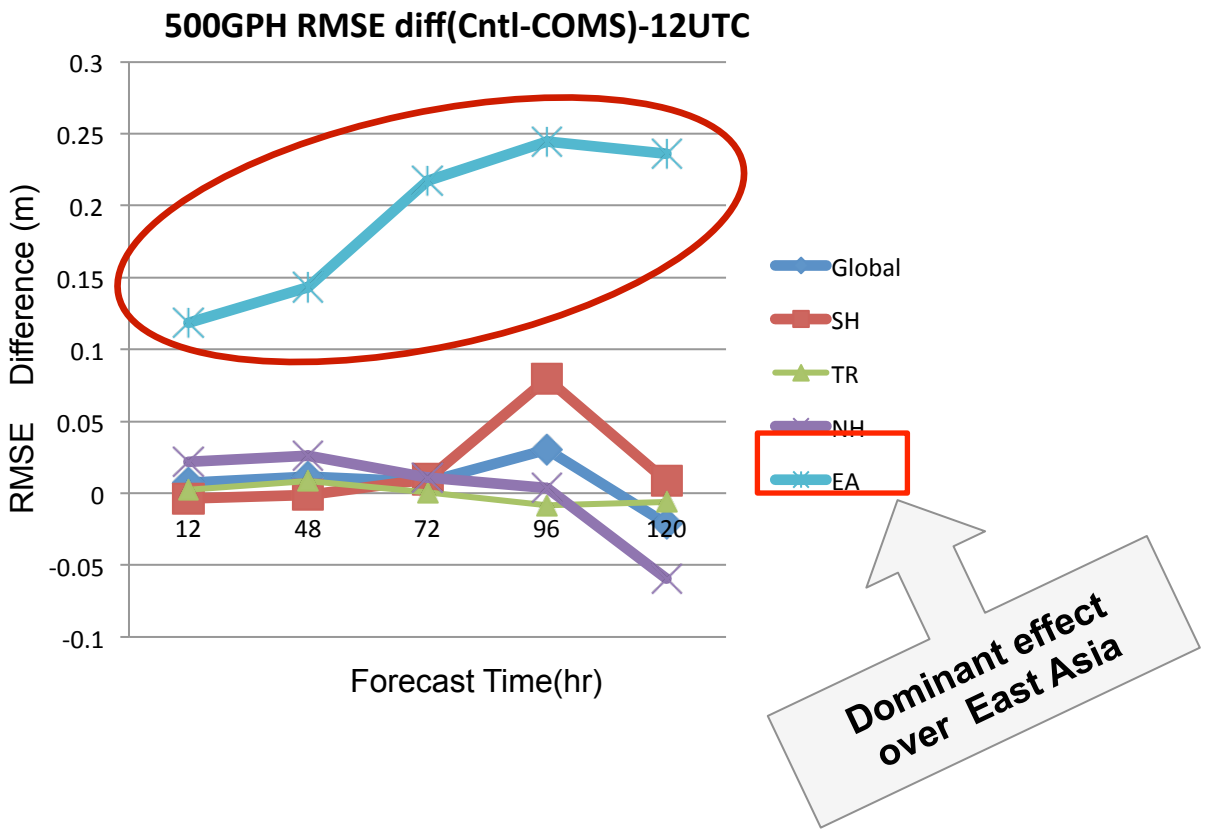


AMV IR1 Bar Plot



2. Application for Operational Forecast

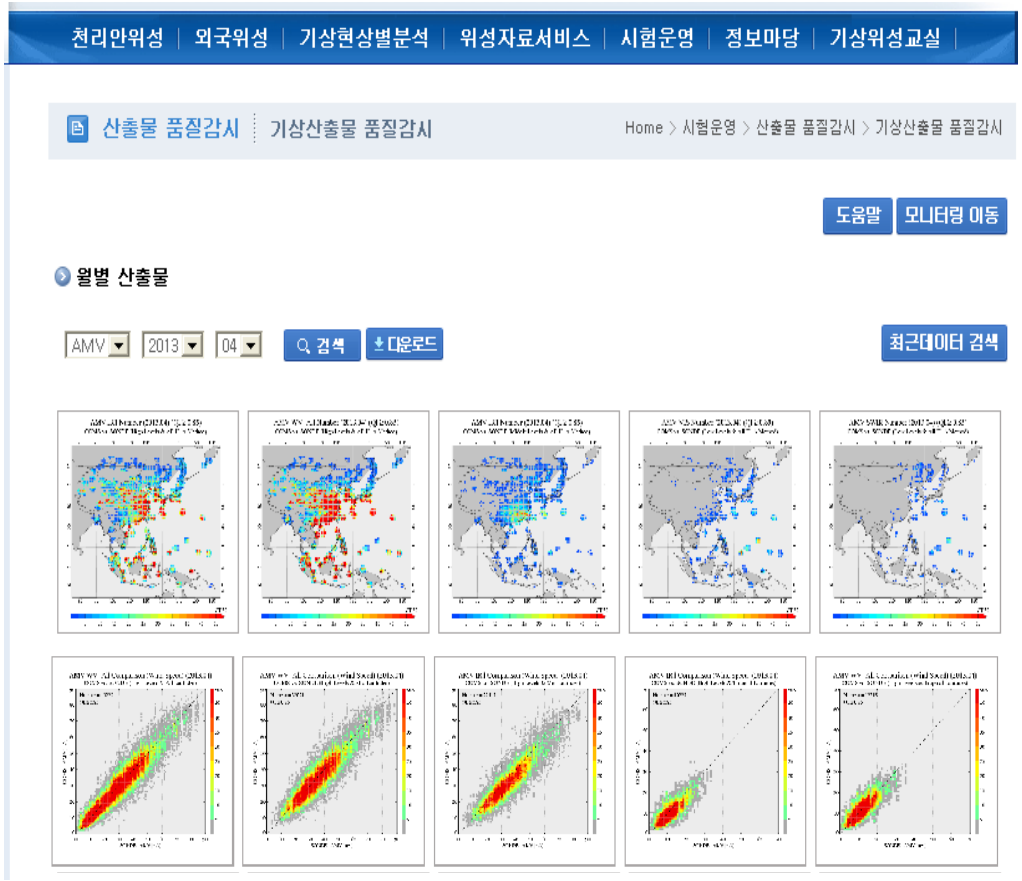
*** Effect of COMS AMV : 1% accuracy upgrade**



2. Application for Operational Forecast

- Example of Product validation & Quality Monitoring web site

* Monthly product



* Statistical Result

KMA SATELLITE WINDS : COMS - Report
(NWP comparison statistics)
Method : AMV _ NWP, AMV _ SONDE, NWP _ SONDE
Reporting Period : 2012010100 - 2012013123
Filtesrs : QUALITY >= 0.85
HEIGHT BOUNDARY : 0 - 1000 (hPa)
LATITUDE BOUNDARY : -50 - 50

ir1

	ALL REGION			NH EX_TROP			TROP		
	AMV_NWP	AMV_SONDE	NWP_SONDE	AMV_NWP	AMV_SONDE	NWP_SONDE	AMV_NWP	AMV_SONDE	NWP_SONDE
ALL Level									
Number	325829	11693	11693	144093	6567	6567	181736	5126	5126
SPD	17.83	28.42	28.42	26.27	39.59	39.59	11.14	14.11	14.11
MVD	2.93	5.54	4.81	3.93	6.84	5.55	2.15	3.88	3.86
Bias	-0.85	-2.02	-0.57	-1.77	-2.61	-0.29	-0.13	-1.27	-0.93
RMSVD	3.76	7.05	5.78	4.90	8.49	6.61	2.52	4.59	4.48
NRMSVD	0.21	0.25	0.20	0.19	0.21	0.17	0.23	0.33	0.32
HIGH Level									
Number	143314	8018	8018	37425	3649	3649	105889	4369	4369
SPD	21.60	31.34	31.34	46.11	51.10	51.10	12.95	14.84	14.84
MVD	3.29	5.91	5.13	5.67	8.19	6.47	2.44	4.00	4.01
Bias	-0.93	-2.30	-0.51	-2.82	-3.39	0.16	-0.26	-1.39	-1.06
RMSVD	4.21	7.54	6.15	6.72	9.91	7.57	2.83	4.72	4.64
NRMSVD	0.19	0.24	0.20	0.15	0.19	0.15	0.22	0.32	0.31
MIDDLE Level									
Number	70127	2562	2562	44170	2216	2216	25957	346	346
SPD	20.60	26.94	26.94	27.15	29.42	29.42	9.45	11.01	11.01
MVD	3.55	5.40	4.57	4.50	5.64	4.74	1.93	3.84	3.49
Bias	-1.09	-1.64	-0.90	-1.76	-1.68	-0.88	0.06	-1.38	-1.06
RMSVD	4.40	6.52	5.35	5.27	6.79	5.54	2.24	4.42	3.98
NRMSVD	0.21	0.24	0.20	0.19	0.23	0.19	0.24	0.40	0.36
LOW Level									
Number	112388	1113	1113	62498	702	702	49890	411	411
SPD	11.30	10.79	10.79	13.78	11.84	11.84	8.18	9.00	9.00
MVD	2.10	3.27	3.04	2.47	3.62	3.33	1.63	2.67	2.53
Bias	-0.61	-0.89	-0.30	-1.13	-1.47	-0.78	0.04	0.09	0.53
RMSVD	2.53	3.87	3.51	2.95	4.24	3.82	1.87	3.13	2.90
NRMSVD	0.22	0.36	0.33	0.21	0.36	0.32	0.23	0.35	0.32

2. Application for Operational Forecast

* Preliminary Validation Result

1. Data : Rawin-Sonde wind observation

2. Area : Northern Hemisphere

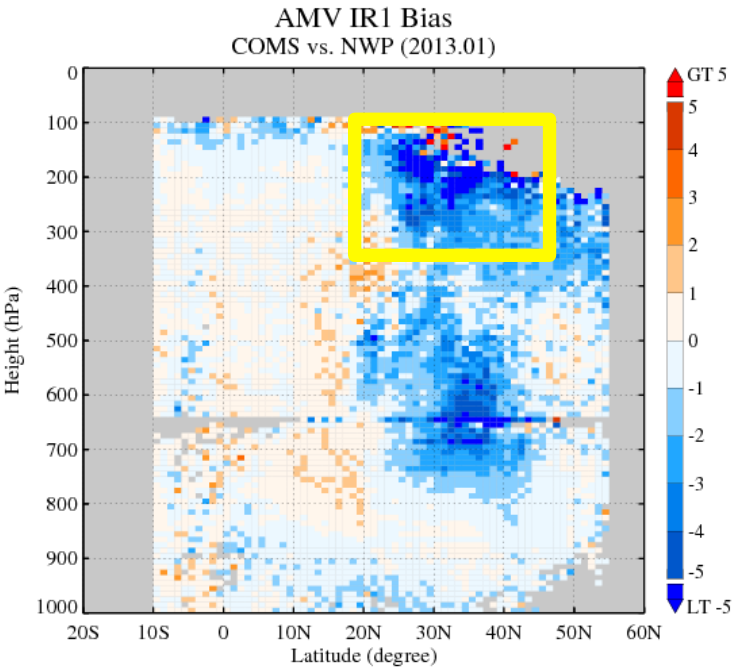
3. Statistical Index : Bias, RMSE, RMSVD

4. Period : 1year(May 2012 – April 2013)

5. Quality indicator of AMV
   5.1 Wind speed(Sonde) difference < 30m/s
   5.2 Wind direction difference < 90 degree
   5.3 Quality Index >= 0.85

6. Characteristics
   6.1 negative bias upper level of higher than 20 degree in N.H.
   (AMV slow trend)
   6.2 large Bias, RMSE[RMS(Vector Difference)] in winter

January 2013



3. Current Research Activity

* Inter comparison study

	Design for Test
1. COMS (Operational)	- Target size : 24 x 24, grid : 12 - Target selection : Regular target selection - Vector estimation : CC - Height assignment : EBBT, STC, IR/WV Intercept, NTC, NTCC
2. COMS_CCC	- Target size : 24 x 24, grid : 12 - Target selection : Regular target selection - Vector estimation : CC - Height assignment : CCC
3. COMS_Nested*	- Target size : 24 x 24, grid : 12 - Target selection : Regular target selection - Vector estimation : Nested tracking - Height assignment : Nested tracking
4. COMS (research)	- Target size : 24 x 24, grid : 6 - Target selection : Optimal target selection - Vector estimation : CC - Height assignment : EBBT, STC, IR/WV Intercept, NTC, NTCC
5. PGE09_HRW	- Target size : 24 x 24, grid : 6 - Target selection : Optimal target selection - Vector estimation : CC - Height assignment : CCC

* Not shown in this slide

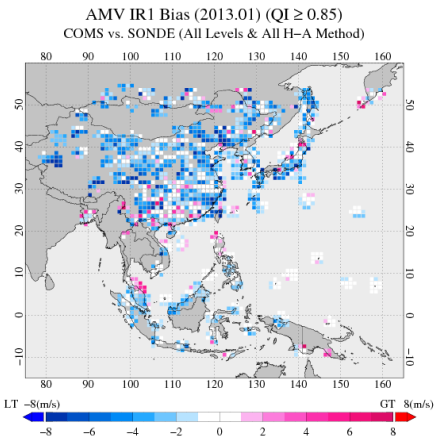
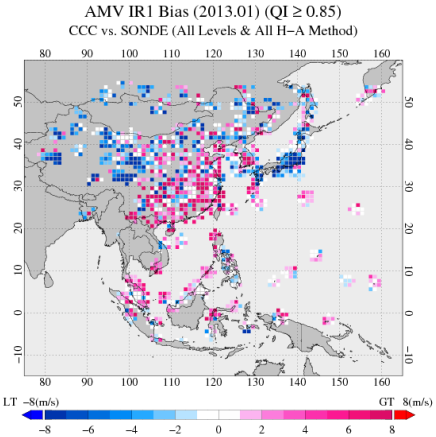
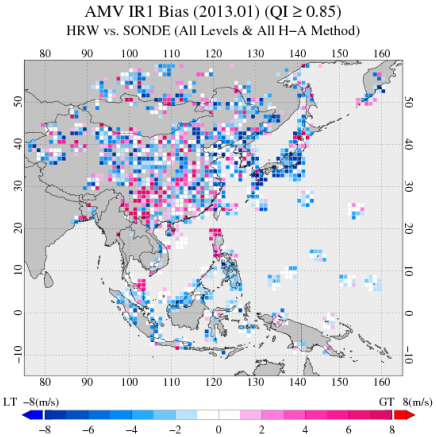
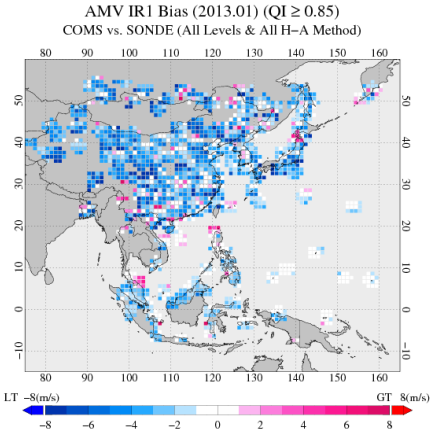
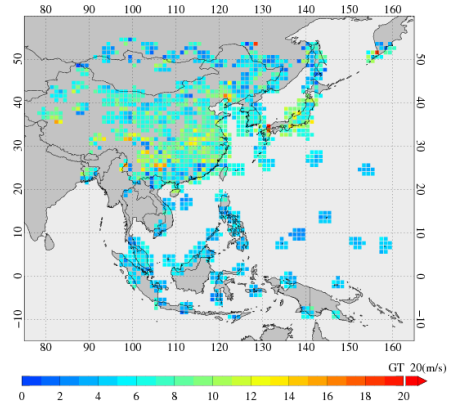
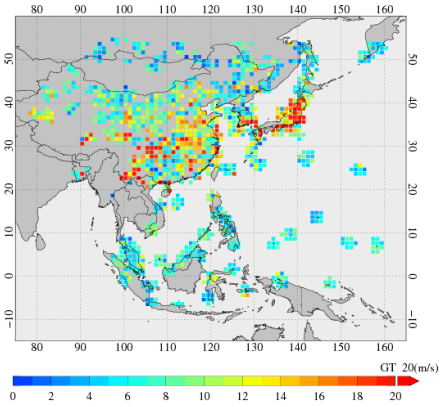
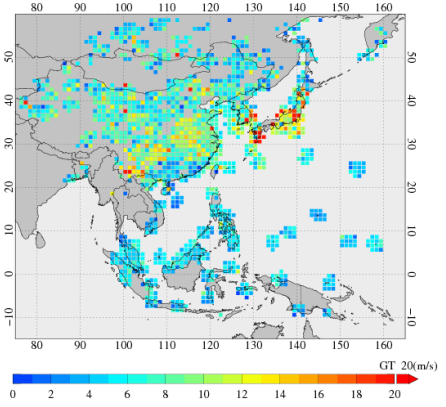
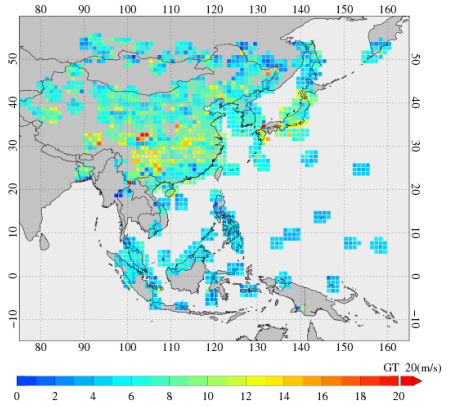
3. Current Research Activity

* Preliminary result of inter comparison

1. Data : (1) Sonde, (2) KMA Global NWP result
2. Period : January, July 2013
3. Validation result
   - Seasonal variation of RMSE(RMSVD) : winter > summer
   - Geographical variation of RMSE(RMSVD) : high lat. > low lat.
   - altitude variation of RMSE(RMSVD) : upper level > lower level
   - HRW (bias), COMS Operational(RMSVD)

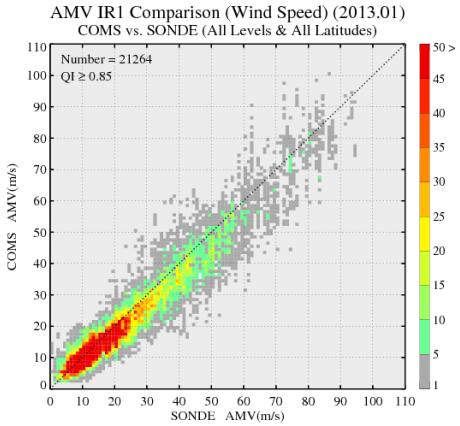
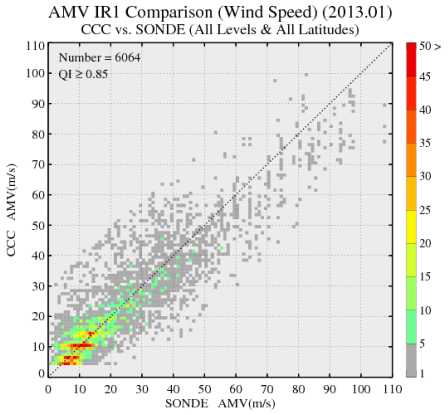
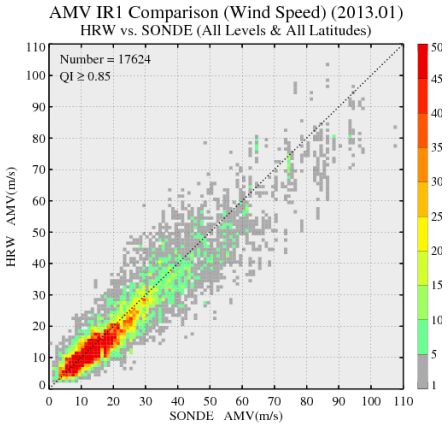
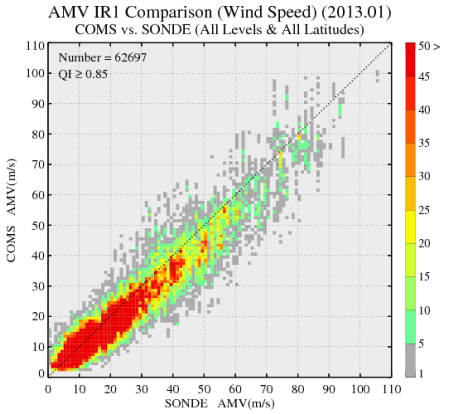
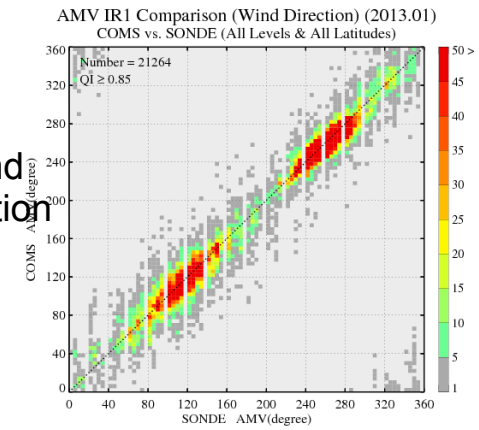
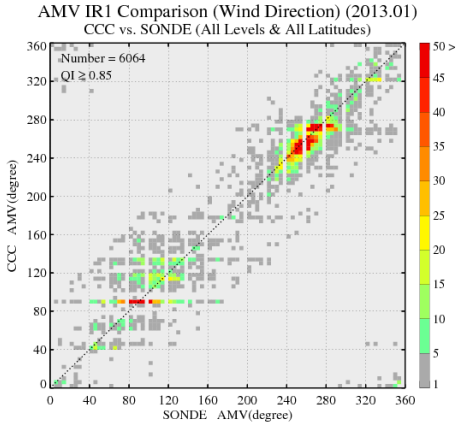
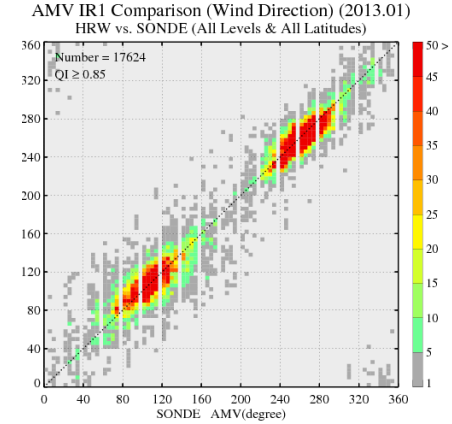
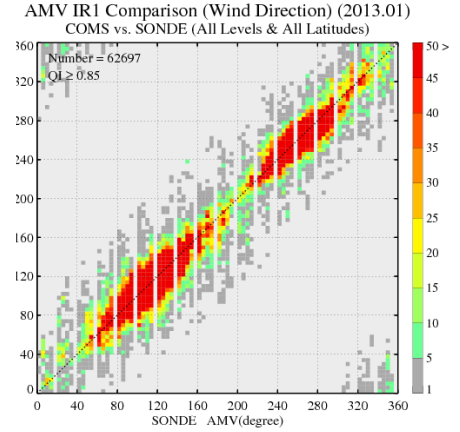
3. Current Research Activity

* Preliminary Comparison Result(January 2013, IR1), Sonde

	1. COMS_Operational	2. COMS_CCC	3. PGE09_HRW	4. COMS_Research
Bias				
RMSVD				

3. Current Research Activity

* Preliminary Comparison Result(January 2013, IR1), Sonde

	1. COMS_Operational	2. COMS_CCC	3. PGE09_HRW	4. COMS_Research
Wind speed				
Wind direction				

3. Current Research Activity

* Preliminary Comparison Result(January 2013, IR1)

January	Height♪ (hPa) ♪	COMS_Operational		HRW		CCC		COMS_Research	
		AMV-NWP	AMV-SONDE	AMV-NWP	AMV-SONDE	AMV-NWP	AMV-SONDE	AMV-NWP	AMV-SONDE
Number	All♪ (100~1000 hPa)	319509	**21264**	**481335**	17624	256077	6064	1781650	62697
	High♪ (100~400 hPa)	140914	**15140**	**235497**	12109	52800	2842	820071	45121
	Mid♪ (400~700 hPa)	56911	2989	**102971**	**3958**	91077	1789	342170	9090
	Low♪ (700~1000 hPa)	121684	**3135**	**142867**	1557	112200	1433	619409	8486
♪	♪								
Bias	All♪ (100~1000 hPa)	-0.69	-1.70	-0.59	**-1.13**	-0.74	**0.13**	**-0.77**	-2.00
	High♪ (100~400 hPa)	-0.72	-2.00	-0.64	**-1.61**	-0.84	-2.23	**-0.81**	-2.31
	Mid♪ (400~700 hPa)	-1.21	-1.31	-0.07	**0.06**	-0.79	3.27	**-1.29**	-1.35
	Low♪ (700~1000 hPa)	-0.42	-0.65	-0.89	**-0.44**	-0.64	1.47	**-0.43**	**-0.99**
♪	♪								
RMSVD	All♪ (100~1000 hPa)	3.54	**6.32**	4.75	7.34	3.70	9.76	**3.77**	6.39
	High♪ (100~400 hPa)	3.88	**6.73**	5.24	7.76	4.21	10.70	**4.05**	6.72
	Mid♪ (400~700 hPa)	4.54	**6.22**	5.36	6.97	3.93	10.20	**4.76**	6.39
	Low♪ (700~1000 hPa)	**2.43**	**3.94**	3.17	**3.79**	3.22	6.82	**2.58**	4.31

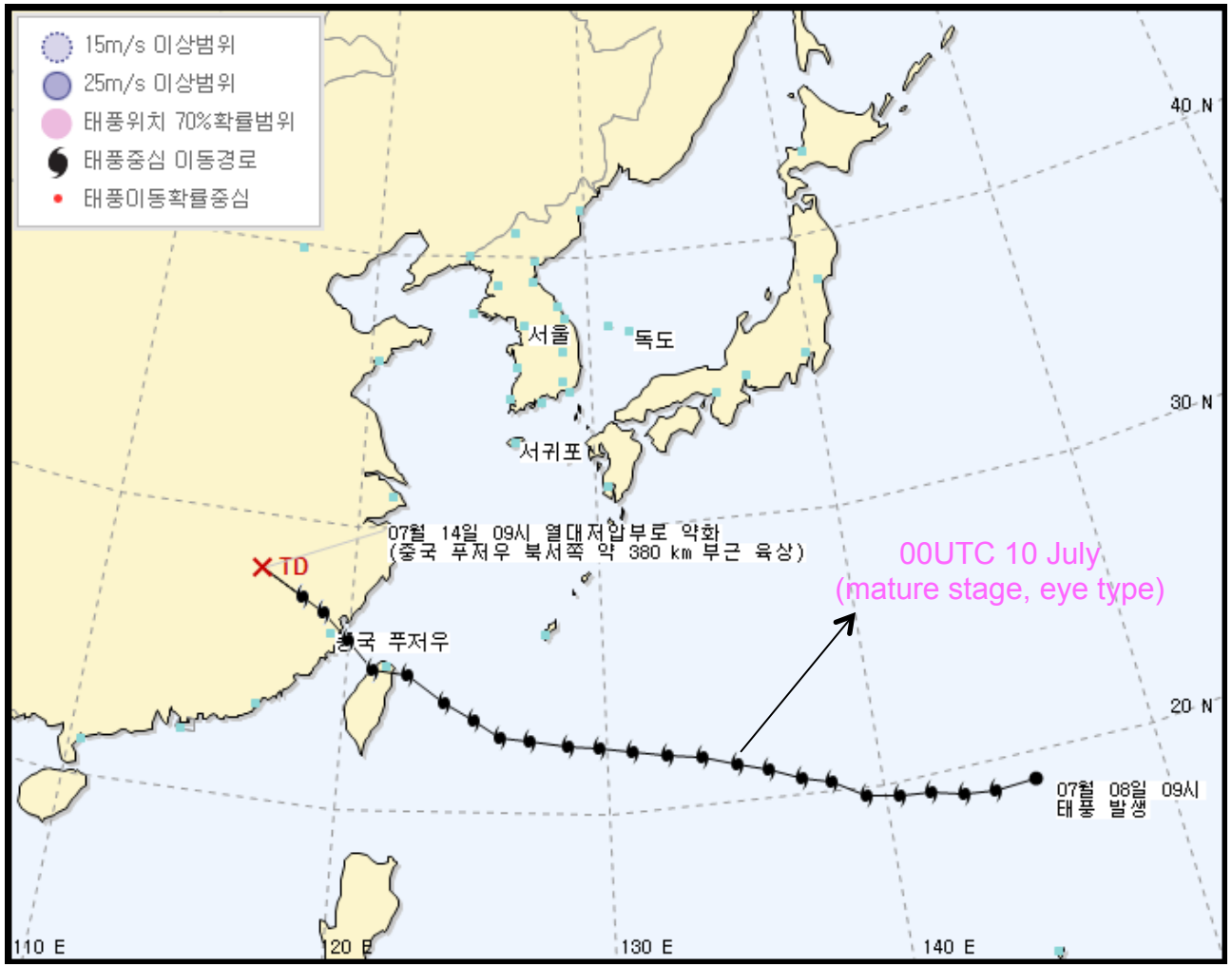
3. Current Research Activity

* Preliminary Comparison Result(July 2013, IR1)

July	Height♪ (hPa) ♪	COMS_Operational		HRW		CCC		COMS_Research	
		AMV-NWP	AMV-SONDE	AMV-NWP	AMV-SONDE	AMV-NWP	AMV-SONDE	AMV-NWP	AMV-SONDE
Number	All♪ (100~1000 hPa)	272070	**33703**	**403622**	25694	260268	9085	1648997	105673
	High♪ (100~400 hPa)	197504	**30230**	**320676**	22717	87113	5572	1228498	95262
	Mid♪ (400~700 hPa)	33430	2360	74383	2767	**128834**	**2958**	214448	7199
	Low♪ (700~1000 hPa)	41136	1113	8563	210	**44321**	555	206051	3212
♪	♪								
Bias	All♪ (100~1000 hPa)	-0.29	-1.11	-0.04	**-0.68**	-0.44	1.66	**-0.40**	-1.36
	High♪ (100~400 hPa)	-0.45	-1.22	**-0.14**	**-0.81**	-0.62	**0.72**	-0.57	-1.48
	Mid♪ (400~700 hPa)	**0.11**	-0.55	0.39	**0.42**	-0.37	3.43	0.08	-0.71
	Low♪ (700~1000 hPa)	0.13	0.85	**0.06**	**-0.51**	-0.27	1.62	0.07	0.60
♪	♪								
RMSVD	All♪ (100~1000 hPa)	2.85	**5.61**	3.47	6.35	3.10	8.40	**3.06**	5.72
	High♪ (100~400 hPa)	3.11	**5.76**	3.63	6.46	3.40	7.77	**3.32**	5.86
	Mid♪ (400~700 hPa)	**2.36**	**4.48**	2.82	5.53	3.04	9.71	2.56	4.58
	Low♪ (700~1000 hPa)	1.69	**3.13**	2.02	3.57	2.64	6.95	**1.59**	3.13

3. Current Research Activity

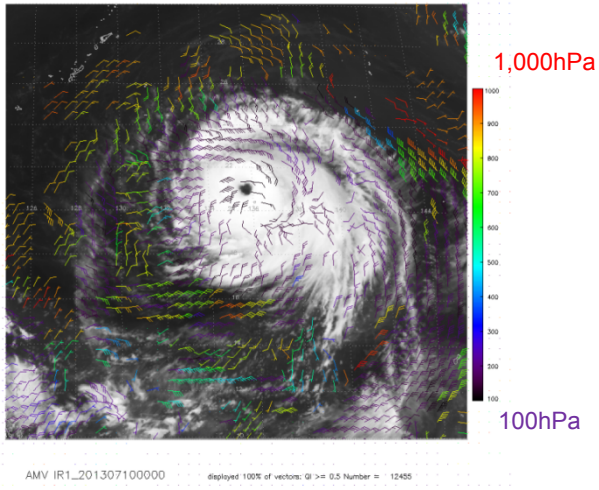
*** Comparison study : 2013 7th Typhoon SOULIK**



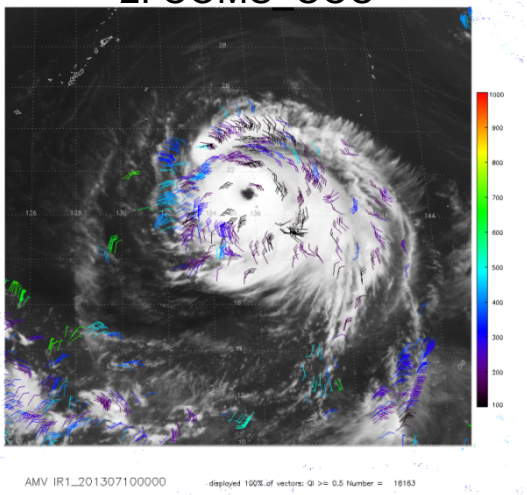
3. Current Research Activity

*** Case study : 2013 7th Typhoon SOULIK**
- 00UTC 10 July 2013(QI > 0.5) -

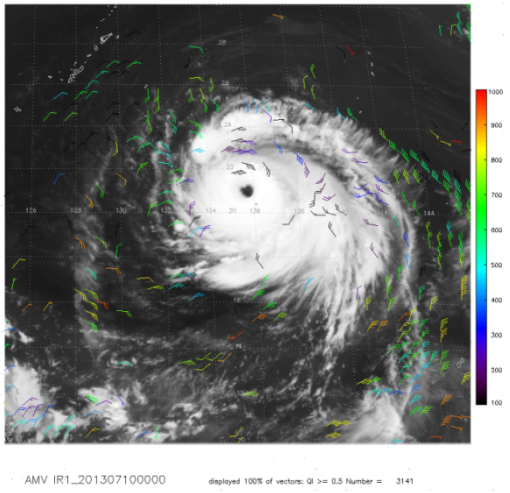
1. COMS_Operational



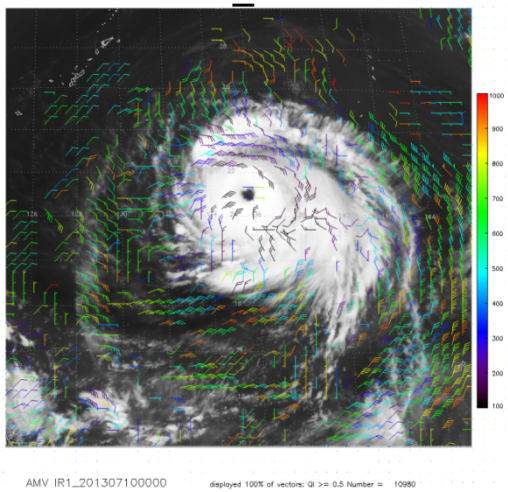
2. COMS_CCC



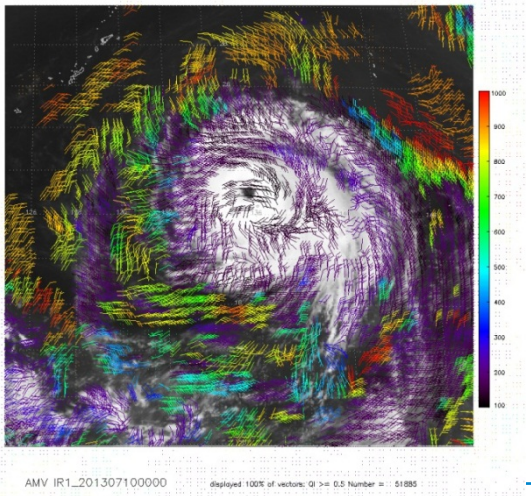
3. COMS_Nested



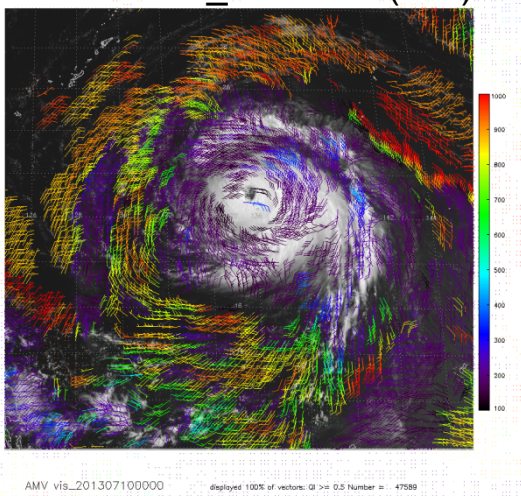
4. PGE09_HRW



5. COMS_Research



6. COMS_Research(VIS)



4. Summary and Future Plan

1. COMS AMV(operational) :
   (1) Target size : 24 x 24, grid : 12
   (2) Target selection : Regular target selection
   (3) Vector estimation : CC
   (4) Height assignment : EBBT, STC, IR/WV Intercept, NTC, NTCC
   (5) 4 channel, 29~30 times/daily
   (6) Validation result
      - Seasonal variation of RMSE(Bias) : winter > summer
      - Geographical variation of RMSE(Bias) : high lat. > low lat.
      - altitude variation of RMSE(Bias) : upper level > lower level

2. Research Activity :
   (1) Comparison study : 5 different design
   (2) Case study : Tropical cyclone

3. Future Plan : Development of GEO-KOMSAT-2A
   (1) launch in 2018
   (2) 16 channels : 4 visible, 2 near-infrared and 10 infrared channels
   (3) 52 meteorological products : Cloud, Precipitation, AMV, Aerosol, Land surface

Thank you