Supplemental Material

All tables in paper with m/s as unit(for RMSE, MAE, Bias) are listed in this section.

Table 2: Cyclone categories and corresponding wind scales.

No.	Category	Abbreviation	WindSpeed(knots)	WindSpeed(m/s)
1	Tropical low pressure	TLP	20.99-33.24	10.8-17.1
2	Tropical storm	TS	33.25-46.64	17.2-24.4
3	Strong tropical storm	STS	46.65-61.22	24.5-32.6
4	Typhoon	TY	61.23-79.68	32.7-41.4
5	Strong Typhoon	ST	79.69-99.12	41.5-50.9
6	Super Typhoon	STY	$\geq$99.13	$\geq$51.0

Table 3: Classification and Intensity Estimation Performance Comparison for different backbone and methodologies.

Backbone	Methodologies	Top-2 Accuracy(%)	F1 score	MAE	RMSE	Bias	Overestimation Rate(%)	Underestimation Rate(%)
2D-CNN	classification+interpolation	74.84	0.41	5.98	7.82	-2.95	76.86	23.14
	regression	74.32	0.44	4.74	6.28	-1.0	71.51	28.49
	cascaded multi-task	78.07	0.54	4.39	6.0	0.34	54.7	45.3
	parallel multi-task(MT-GN)	79.5	**0.57**	4.36	5.82	0.67	55.91	44.09
Res-2D-CNN	classification+interpolation	85.51	0.49	5.26	6.87	-2.86	71.54	28.46
	regression	86.56	0.52	4.0	5.35	-0.9	62.58	37.42
	cascaded multi-task	90.15	0.61	3.7	5.01	0.44	46.06	53.94
	parallel multi-task(MT-GN)	**90.37**	**0.64**	3.63	4.89	0.78	46.59	53.41
3D-CNN	classification+interpolation	75.15	0.43	5.9	7.67	-2.95	79.01	20.99
	regression	76.07	0.46	4.61	6.09	-0.99	71.5	28.5
	cascaded multi-task	79.16	0.54	4.25	5.83	0.35	53.55	46.45
	parallel multi-task(MT-GN)	**81.18**	**0.58**	4.26	5.73	0.7	55.59	44.41
Res-3D-CNN	classification+interpolation	79.97	0.46	5.56	7.33	-2.91	75.96	24.04
	regression	82.23	0.48	4.41	5.76	-0.96	66.88	33.12
	cascaded multi-task	85.45	0.57	4.08	5.55	0.39	51.08	48.92
	parallel multi-task(MT-GN)	**85.49**	**0.60**	3.94	5.33	0.72	51.85	48.15

Table 4: A rough comparison between RMSEs and MAEs of TC intensities Estimation of our proposed MT-GN and other satlellite-based work

Models	Methodologies	Data	RMSE(m/s)	MAE(m/s)
DAVT	Tradition/Statistical analysis	IR	9.78	8.56
Deep CNN	classification+interpolation	IR	6.66	5.21
DeepMicroNet	classification+interpolation	MINT	5.45	—
M16	classification+interpolation	IR	5.17	—
ETCI	classification+interpolation	IR	8.41	7.22
CNN-TC	regression	IR,PMW	5.34	—
MLR	regression	IR	8.34	7.65
TCIENet	regression	IR,WV	5.13	4.03
Transfer-VGG19	regression	IR	6.81	—
3D-CNN	regression	SWIR,WV,IR	5.83	4.45
Deep PHURIE	regression	IR	5.43	4.31
TCICENet	cascaded multi-task	IR	4.93	3.83
T-TCNN	cascaded multi-task	MSI	1.93	1.61
MT-GN	parallel multi-task	IR	4.61	4.13
MT-GN	parallel multi-task	IR1,IR2,WV,SWIR	4.44	3.97
MT-GN	parallel multi-task	PCA1	5.36	4.13
MT-GN	parallel multi-task	PCA4	4.67	3.86
MT-GN	parallel multi-task	MSI	4.89	3.63

Table 5: Comparison of Classification and Intensity Esitimation Performance Using different format of input data.

Input channel	channel number	Top-2 Accuracy(%)	F1 score	MAE	RMSE	Bias
IR	1	88.17	0.57	4.13	4.61	1.13
IR,WV	4	89.15	0.6	3.97	4.44	0.77
PCA1	1	83.36	0.51	4.13	5.36	1.13
PCA4	4	89.45	0.53	3.86	4.67	0.36
MSI	14	90.37	0.64	3.63	4.89	0.78
Day	14	75.08	0.43	5.22	6.44	2.12
Night	8	82.96	0.4	4.57	5.78	1.98

Table 6: Comparison of Intensity Estimation Performance for Each TC category on 14 channel FY-4A data.

Model	Category	MAE	RMSE	Bias	Overestimation Rate(%)	Underestimation Rate(%)
MT-GN	TLP	2.3	3.1	-1.59	73.74	26.26
	TS	3.26	3.96	1.29	30.55	69.45
	STS	3.71	4.78	3.98	24.77	75.23
	TY	3.43	5.19	1.63	44.44	55.56
	ST	3.89	5.91	3.32	26.53	73.47
	STY	4.1	5.74	3.81	24.56	75.44
	Avg	3.63	4.89	0.78	46.59	53.41

Table 7: Classification and Intensity Estimation Result of different loss weight λ.

λ	0.5	0.8	1	1.5	2	2.5	3
Top-2 Accuracy(%)	75.66	73.48	83.70	**90.37**	87.70	81.12	79.08
RMSE	5.98	5.85	5.22	4.89	5.15	5.27	5.25

Table 8: Ablation Study of Proposed Improvement.

Method	Top-2 Accuracy(%)	RMSE
Regression	86.56	5.35
Parallel Multi-task	87.08	5.05
Parallel Multi-task+TDEM	89.32	4.92
Parallel Multi-task+TDEM+Balanced Loss	90.37	4.89