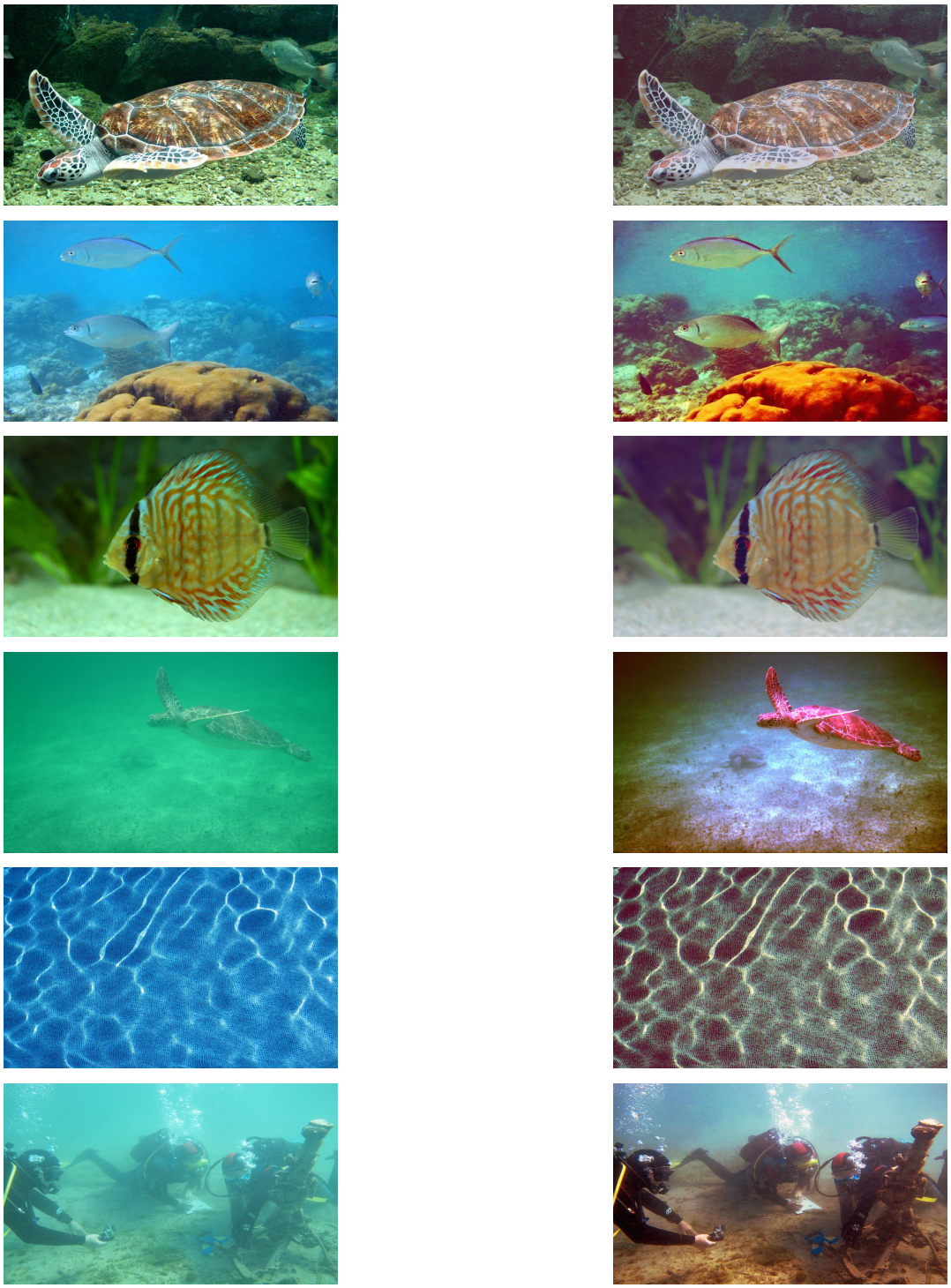
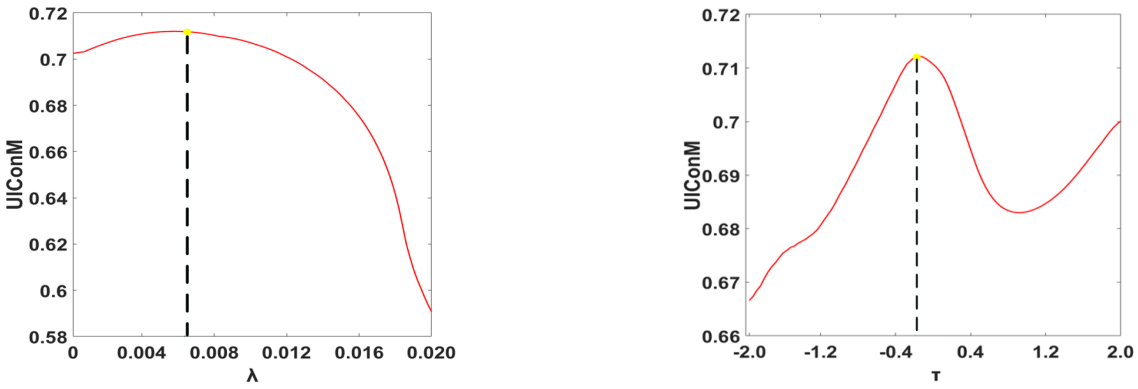


(a) (b)

Fig. 1: The enhanced results of our methods. (a) Raw images. (b) OURS.



(a) (b)

Fig. 2: Parameter evaluation. (a) UIConM versus τ. (b) UIConM versus λ. We investigate the sensitivity of the proposed algorithm about parameter settings by varying one parameter per-time when fixing the other at the current values. In Fig. 4, the results of UIConM (Underwater Image Contrast Measure) reach the highest values when we set $\lambda = 0.006$ and $\tau = -0.2$.

Table 1 Runtime comparison. We calculate the average runtime of 70 images (forming each size), and we test 490 images including 7 different sizes (each size has 70 images). The first value is the above average time (seconds), and the second value in parentheses is the quantity of images that can be processed in one second. Note that our method obtains fastes runtime in different image sizes, and Common Intermediate Format (CIF = 320 $\times$ 288) can be real-time processed by our method, while other competitive methods cannot achieve this advantage.

Methods	200×200	300×300	350×350	360×360	370×370	400×400	320×288
ARC	0.12 (8)	0.22 (4)	0.27 (3)	0.27 (3)	0.31 (3)	0.34 (2)	0.20 (5)
RBE	0.54 (1)	0.85 (1)	1.11 (0)	1.15 (0)	1.23 (0)	1.30 (0)	0.99 (1)
UGAN	0.14 (7)	0.06 (16)	0.07 (14)	0.07 (14)	0.07 (14)	0.07 (14)	0.06 (16)
UWGAN	0.04 (23)	0.06 (16)	0.07 (14)	0.08 (13)	0.08 (13)	0.09 (11)	0.06 (16)
WSCT	0.07 (13)	0.81 (12)	0.09 (10)	0.10 (10)	0.10 (10)	0.10 (9)	0.08 (12)
OURS	**0.01** (**85**)	**0.03** (**40**)	**0.03** (**29**)	**0.04** (**26**)	**0.05** (**19**)	**0.06** (**16**)	**0.03** (**34**)