



Figure 2. The results of the water extraction (A is the test data, B is the artificially marked data, C is the result of traditional 2D Otsu, D₁, D₂, D₃, D₄, D₅ are the results of the proposed method using contrast, entropy, homogeneity, mean, second moment texture factors, respectively.)

From the Figure 2, the water targets are slightly affected by the obvious road in the left of the SAR image. Compared with the traditional 2D Otsu method, the proposed method well erases the road using using entropy, homogeneity and mean texture factors. That shows the new method can well optimize the commission.

An accuracy evaluation for the traditional 2D Otsu and the proposed method according to the artificially marked image is shown in Table 1.

Table 1. Comparison of the results of the two Otsu method

| | OA(%) | KC | Commission(%) | Omission(%) | Prod.Acc(%) | User.Acc(%) |
|----------------|-------|--------|---------------|-------------|-------------|-------------|
| C | 93.83 | 0.8768 | 9.85 | 1.89 | 98.11 | 90.15 |
| D ₁ | 94.53 | 0.8907 | 6.32 | 4.76 | 95.24 | 93.68 |
| D ₂ | 89.98 | 0.7992 | 7.34 | 13.65 | 86.35 | 92.66 |
| D ₃ | 96.88 | 0.9376 | 2.1 | 4.32 | 95.68 | 97.90 |
| D ₄ | 93.51 | 0.8704 | 9.68 | 2.86 | 97.14 | 90.32 |
| D ₅ | 94.84 | 0.8969 | 8.36 | 1.57 | 98.43 | 91.64 |

As reflected in Table 1, the commission of the water is declined, but the magnitude for the different texture factors is different. Compared with the traditional 2D Otsu method, after using the homogeneity factor, the OA of data set D₃ is increased by 3.05%, and the commission is declined by 7.75%. That is, the proposed method shows the best improvement. This shows that the proposed method is more effective for areas with texture features.

6. CONCLUSION

This paper deduces a new 2D Otsu method for water extraction from SAR image, which calculates the texture factors such as contrast, entropy, homogeneity, mean and second moment based on gray level co-occurrence matrix(GLCM) method and introduces them into the traditional 2D Otsu, optimizing the denoising capability of the original 2D Otsu. The results show the the better effect than the traditional 2D Otsu, which provides support for the further extraction of water bodies and show a new basic step for disaster emergency monitoring.

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