Supplement of

Human land uses enhance sediment denitrification and N$_2$O production in Yangtze lakes primarily by influencing lake water quality

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Table S1 The geographic location, morphology and watershed land uses of 20 Yangtze lakes in China.

| Lake            | Sampling sites | Geographic location | Lake morphology | Watershed land uses |
|-----------------|----------------|---------------------|-----------------|---------------------|
|                 |                | Longitude (°E)       | Latitude (°N)   | Elevation (m)       | Mean depth (m) | Surface area (km²) | Volume (10⁸ m³) | Vegetation (%) | Water body (%) | HDL (%) | NDVI (%)   |
|                 |                |                     |                 |                     |                 |                   |                 |                |                |         |           |
| 1. Lake Baidanghu | 3              | 117.38              | 30.82           | 10.04               | 3.06            | 39.67              | 1.21             | 25.80           | 10.18           | 64.02   | 0.53       |
| 2. Lake Bohu     | 4              | 116.43              | 30.15           | 12.62               | 4.41            | 180.40             | 7.94             | 19.73           | 21.11           | 59.16   | 0.51       |
| 3. Lake Caizihu  | 3              | 117.08              | 30.83           | 10.34               | 1.67            | 172.10             | 2.87             | 35.51           | 8.85            | 55.64   | 0.54       |
| 4. Lake Chaohu   | 4              | 117.50              | 31.57           | 8.37                | 2.69            | 769.55             | 20.70            | 19.00           | 9.99            | 71.00   | 0.45       |
| 5. Lake Chenyaohu | 3              | 117.63              | 30.88           | 12.00               | 2.20            | 20.01              | 0.72             | 18.26           | 14.63           | 67.11   | 0.52       |
| 6. Lake Cihu     | 3              | 115.07              | 30.20           | 16.00               | 1.75            | 8.20               | 0.17             | 38.15           | 11.36           | 49.79   | 0.45       |
| 7. Lake Haikouhu | 3              | 115.23              | 30.04           | 19.00               | 3.70            | 12.90              | 0.48             | 34.31           | 14.46           | 51.24   | 0.51       |
| 8. Lake Huangdahu| 4              | 116.39              | 30.03           | 12.69               | 3.94            | 299.20             | 11.79            | 21.47           | 21.90           | 56.63   | 0.34       |
| 9. Lake Linghu   | 3              | 117.06              | 30.53           | 11.00               | 1.90            | 4.50               | No data          | 1.35            | 18.64           | 80.00   | 0.39       |
| 10. Lake Longganhu | 4           | 116.19              | 29.94           | 12.98               | 3.78            | 316.20             | 11.96            | 27.04           | 19.08           | 53.89   | 0.52       |
| 11. Lake Makouhu | 3              | 115.43              | 29.96           | 13.00               | 2.80            | 2.90               | 0.11             | 31.79           | 14.38           | 53.83   | 0.47       |
| 12. Lake Poganghu| 4              | 117.14              | 30.63           | 12.11               | 1.52            | 60.00              | 0.91             | 31.49           | 10.41           | 58.11   | 0.54       |
| 13. Lake Shengjinhu | 4          | 117.10              | 30.36           | 10.79               | 1.26            | 78.48              | 0.99             | 56.47           | 9.92            | 33.60   | 0.57       |
| 14. Lake Taibaihu| 3              | 115.80              | 29.97           | 13.38               | 3.20            | 25.10              | 0.80             | 30.96           | 8.89            | 60.16   | 0.58       |
| 15. Lake Wuchanghu | 4            | 116.73              | 30.28           | 11.99               | 3.43            | 100.50             | 3.45             | 10.63           | 15.21           | 74.16   | 0.49       |
| 16. Lake Wushanhu | 3            | 115.57              | 29.92           | 18.20               | 3.10            | 16.10              | 0.50             | 13.51           | 12.30           | 74.18   | 0.48       |
| 17. Lake Yandonghu | 3            | 114.57              | 30.53           | 18.00               | 3.00            | 8.66               | No data          | 5.65            | 42.51           | 51.65   | 0.39       |
| 18. Lake Yanxiu  | 3              | 114.48              | 30.58           | 20.40               | 1.90            | 11.80              | 0.22             | 4.00            | 33.80           | 61.10   | 0.38       |
| 19. Lake Yanglanhu | 3            | 114.88              | 30.39           | 16.00               | 2.50            | 4.23               | No data          | 13.32           | 18.07           | 68.61   | 0.41       |
| 20. Lake Yiaihu  | 3              | 114.90              | 30.44           | 19.00               | 1.80            | 3.21               | 0.06             | 2.48            | 23.26           | 74.27   | 0.38       |

HDL: Human-dominated land uses; NDVI: Normalised difference vegetation index.
| Lake       | Water quality | Sediment characteristics | Plant community |
|------------|---------------|--------------------------|------------------|
|            | Cond          | ORP          | DO            | NO₃⁻  | NH₄⁺ | TN  | TC  | TOC | pH | Moisture | Bulk density | STN  | STC | Richness | Biomass |
|            | (µS/cm)       | (mv)         | (mg/L)       | (mg/L) | (mg/L) | (mg/L) | (mg/L) | (mg/L) | (%) | (g/cm³)   | (mg/g)        | (mg/g) | (g/m³) |          |         |
| Lake Baidanghu | 173.33 | 152.67 | 6.91 | 0.53 | 0.18 | 2.18 | 8.47 | 2.61 | 5.52 | 59.58 | 0.88 | 0.27 | 16.73 | 0.33 | 1981 |
| Lake Bohu   | 223.25 | 137.25 | 7.55 | 0.09 | 0.22 | 0.33 | 16.45 | 2.89 | 7.36 | 60.68 | 0.85 | 0.41 | 10.70 | 0.00 | 0    |
| Lake Caizihu| 127.67 | 82.00  | 6.60 | 0.49 | 0.08 | 1.09 | 9.67 | 2.49 | 6.43 | 60.97 | 0.83 | 0.31 | 13.79 | 0.00 | 0    |
| Lake Chaohu | 286.50 | 107.50 | 6.33 | 0.65 | 0.13 | 1.27 | 17.42 | 4.73 | 6.66 | 26.58 | 0.64 | 0.20 | 5.39  | 0.00 | 0    |
| Lake Chenyaohu | 265.33 | 40.23  | 5.19 | 0.82 | 0.24 | 1.54 | 20.11 | 6.60 | 5.90 | 65.40 | 0.88 | 0.24 | 36.82 | 0.00 | 0    |
| Lake Chihu  | 338.67 | 82.33  | 6.30 | 0.22 | 0.21 | 0.48 | 18.55 | 3.44 | 7.93 | 62.01 | 0.89 | 0.18 | 53.54 | 0.00 | 0    |
| Lake Haikouhu | 304.67 | 153.33 | 8.13 | 0.52 | 0.02 | 0.31 | 16.70 | 2.53 | 8.01 | 66.14 | 0.87 | 0.34 | 53.88 | 1.00 | 2438 |
| Lake Huangdahu | 258.25 | 140.25 | 7.52 | 0.2  | 0.22 | 0.40 | 19.90 | 3.30 | 7.47 | 62.68 | 0.86 | 0.20 | 23.37 | 0.50 | 1191 |
| Lake Linghu | 354.33 | -80.67 | 4.58 | 0.17 | 0.5  | 2.65 | 21.63 | 4.14 | 7.79 | 66.31 | 0.94 | 1.54 | 43.23 | 0.00 | 0    |
| Lake Longganhu | 280.50 | 132.44 | 5.65 | 0.33 | 0.34 | 0.44 | 23.90 | 5.14 | 7.67 | 57.23 | 0.84 | 0.57 | 14.54 | 0.00 | 0    |
| Lake Makouhu | 325.00 | 110.33 | 4.65 | 1.5  | 0.11 | 1.18 | 31.40 | 6.26 | 7.58 | 66.85 | 0.88 | 0.38 | 16.90 | 0.00 | 0    |
| Lake Poganghu | 216.50 | 64.75  | 5.02 | 0.11 | 0.12 | 1.11 | 21.93 | 5.34 | 6.72 | 68.50 | 0.92 | 0.22 | 25.82 | 0.25 | 1714 |
| Lake Shengjinhu | 170.75 | 117.00 | 6.01 | 0.76 | 0.05 | 0.46 | 17.60 | 2.47 | 8.06 | 66.60 | 0.87 | 0.26 | 22.66 | 0.00 | 0    |
| Lake Taibaihu | 170.00 | 133.33 | 4.59 | 0.53 | 0.14 | 0.67 | 21.54 | 5.15 | 6.58 | 51.68 | 0.81 | 0.30 | 17.89 | 0.00 | 0    |
| Lake Wuchanghu | 147.50 | 135.00 | 5.79 | 0.71 | 0.2  | 1.27 | 10.65 | 3.56 | 5.84 | 71.33 | 0.91 | 1.74 | 30.17 | 0.00 | 0    |
| Lake Wushanhu | 323.00 | 98.00  | 4.51 | 0.25 | 0.17 | 1.36 | 24.06 | 5.84 | 7.09 | 64.62 | 0.93 | 0.44 | 22.91 | 0.00 | 0    |
| Lake Yandonghu | 197.33 | 77.73  | 7.90 | 0.45 | 0.12 | 0.33 | 16.21 | 4.06 | 7.76 | 56.29 | 0.87 | 0.77 | 26.96 | 1.00 | 1989 |
| Lake Yanxihu | 193.67 | 129.00 | 6.69 | 0.65 | 0.23 | 0.95 | 24.08 | 4.75 | 8.19 | 61.54 | 0.89 | 0.51 | 22.87 | 0.00 | 0    |
| Lake Yanglanhu | 338.33 | 74.33  | 5.11 | 0.86 | 0.3  | 1.12 | 23.70 | 4.12 | 7.74 | 64.79 | 0.87 | 0.87 | 26.09 | 0.00 | 0    |
| Lake Yiaihu | 359.67 | 136.33 | 4.53 | 0.19 | 0.28 | 2.87 | 25.09 | 5.31 | 7.94 | 55.50 | 0.8  | 0.42 | 19.29 | 0.00 | 0    |
# Table S3 The sediment denitrification rate, N₂O production rate and relative N₂O production (Mean±SD) of 20 Yangtze lakes in China.

| Lake            | Potential denitrification rate (ng N g⁻¹ h⁻¹) | Background denitrification rate (ng N g⁻¹ h⁻¹) | N₂O production rate (ng N g⁻¹ h⁻¹) | Relative N₂O production |
|-----------------|-----------------------------------------------|-----------------------------------------------|-----------------------------------|-------------------------|
| 1. Lake Baidanghu | 32.04±3.40                                   | 4.25±1.69                                     | 0.32±0.26                        | 0.07±0.06               |
| 2. Lake Bohu     | 20.19±11.32                                  | 0.97±0.24                                     | 0.05±0.05                        | 0.05±0.05               |
| 3. Lake Caizhu   | 24.91±21.28                                  | 6.31±2.69                                     | 0.71±0.41                        | 0.13±0.08               |
| 4. Lake Chaohu   | 11.24±2.55                                   | 2.01±1.05                                     | 0.23±0.24                        | 0.12±0.11               |
| 5. Lake Chenyaohu| 67.34±20.24                                  | 1.74±1.03                                     | 0.31±0.18                        | 0.19±0.09               |
| 6. Lake Cihu     | 80.61±10.12                                  | 0.92±0.16                                     | 0.16±0.08                        | 0.19±0.11               |
| 7. Lake Haikouhu | 55.10±9.68                                   | 0.98±0.77                                     | 0.10±0.02                        | 0.34±0.49               |
| 8. Lake Huangdahu| 24.99±5.38                                   | 0.67±0.21                                     | 0.12±0.03                        | 0.19±0.05               |
| 9. Lake Linghu   | 60.39±17.08                                  | 18.95±13.16                                   | 0.52±0.49                        | 0.02±0.01               |
| 10. Lake Longganhu| 20.17±3.33                                  | 1.39±0.61                                     | 0.09±0.08                        | 0.09±0.09               |
| 11. Lake Makouhu | 125.37±7.52                                  | 2.11±1.22                                     | 0.51±0.33                        | 0.35±0.30               |
| 12. Lake Poganghu| 19.02±12.01                                  | 3.58±2.92                                     | 0.69±1.20                        | 0.12±0.14               |
| 13. Lake Shengjinhu| 37.17±28.88                                 | 0.93±0.52                                     | 0.13±0.08                        | 0.15±0.03               |
| 14. Lake Taibaihu| 70.99±7.98                                   | 3.66±0.80                                     | 0.34±0.34                        | 0.11±0.13               |
| 15. Lake Wuchanghu| 84.17±77.14                                 | 1.67±1.05                                     | 0.12±0.09                        | 0.08±0.04               |
| 16. Lake Wushanhu| 45.62±16.27                                  | 2.59±1.36                                     | 0.25±0.23                        | 0.11±0.12               |
| 17. Lake Yandonghu| 11.72±6.46                                  | 0.95±0.19                                     | 0.07±0.04                        | 0.08±0.06               |
| 18. Lake Yanxihu | 34.41±33.78                                  | 2.12±2.01                                     | 0.15±0.05                        | 0.62±0.99               |
| 19. Lake Yanglanhu| 53.08±49.93                                 | 1.79±1.41                                     | 0.30±0.21                        | 0.25±0.25               |
| 20. Lake Yiaihu  | 54.49±31.98                                  | 2.21±1.41                                     | 0.20±0.19                        | 0.08±0.04               |