

Supplementary Materials to

Investigating the Impact of Large Lakes on Local Precipitation: Case Study of Lake Urmia, Iran

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1. Introduction

The supplementary materials comprise additional Tables (Table S1 to S6) and Figures (Fig. S1 to S4). Table S1 provides a concise overview of the geographical locations of synoptic stations utilized in this study. Table S2 displays the average monthly and annual actual evapotranspiration from October 2013 to September 2015, categorized by different land covers in the Lake Urmia basin, Iran. Table S3 presents summary statistics (mean, median, and standard deviation) for seasonal and annual climate variables in synoptic stations, such as precipitation, relative humidity, vapor pressure, and dewpoint temperature during the entire study period (1986-2017) and its sub-periods (1986-1995, 1996-2017). Additionally, Table S3 highlights the percentage changes in these metrics from 1986-1995 to 1996-2017. Table S4 employs comparative analysis of meteorological parameters between Saez and Sarab stations using statistical indicators, P-values, and T-statistics. Table S5 exhibits correlation coefficient matrix illustrating the relationships between climate variables and Urmia Lake water level. Table S6 employs comparative analysis of meteorological parameters before and after the identified change point in 1995 using statistical indicators, P-Values, and T-Statistics. Fig. S1 present distributed annual average actual evapotranspiration for the Lake Urmia basin, respectively. Fig. S2 offers a schematic representation of the violin plot along with its accompanying details. Fig. S3 and Fig. S4 illustrate the violin plots depicting seasonal climate variables for Saez and Sarab stations during both pre- and post-1995 periods, respectively.

Table S1: Geographical location of synoptic stations utilized in this study

| Station | Latitude (°) | Longitude (°) | Distance from the lake center (km) | Elevation (m a.s.l.) |
|---------|-----------------|------------------|---------------------------------------|----------------------|
| Saqez | 36.22 | 46.31 | 185 | 1523 |
| Sarab | 37.93 | 47.53 | 195 | 1650 |

Table S2: Monthly average and annual actual evapotranspiration (AET) from October 2013 to September 2015 for various land covers in the Lake Urmia basin (Data source: Urmia Lake Research Programme, <https://abopa.ir/en/ulrp5/> (accessed on October 1, 2023))

| Land Cover | | Area | | Area Contribution | | Actual evapotranspiration (MCM) | | | | | | | | | | | | AET Contribution | | |
|-----------------------|----------------------------|--------------------|-------|--------------------|-------|---------------------------------|--------|---------|---------|---------|---------|---------|---------|---------|---------|--------|--------|------------------|----------|-------|
| | | (km ²) | (%) | (km ²) | (%) | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual | (MCM) | (%) |
| Agricultural activity | Irrigated wheat and barley | 1484.04 | 2.89 | 15426.26 | 30.00 | 25.04 | 20.20 | 15.53 | 50.23 | 83.11 | 100.00 | 95.43 | 75.92 | 53.70 | 38.87 | 12.20 | 7.94 | 578.17 | 5110.33 | 30.69 |
| | Irrigated summer crops | 1320.36 | 2.57 | | | 26.81 | 18.94 | 15.83 | 43.55 | 81.12 | 136.55 | 167.54 | 158.14 | 108.52 | 55.65 | 17.59 | 8.93 | 839.17 | | |
| | Orchard | 2781.13 | 5.41 | | | 51.51 | 39.55 | 44.64 | 99.48 | 187.53 | 279.03 | 316.58 | 295.63 | 203.05 | 109.48 | 36.74 | 20.43 | 1683.64 | | |
| | Rainfed agriculture | 6650.92 | 12.93 | | | 88.67 | 94.61 | 87.36 | 156.36 | 228.09 | 186.80 | 181.83 | 126.43 | 96.05 | 107.79 | 37.90 | 39.51 | 1431.39 | | |
| | Fallow | 3189.81 | 6.20 | | | 41.65 | 45.86 | 39.92 | 59.85 | 82.43 | 60.89 | 71.47 | 48.57 | 39.26 | 50.60 | 17.79 | 19.68 | 577.95 | | |
| Lake Urmia | Barren land | 3377.76 | 6.57 | 7060.46 | 13.74 | 64.66 | 63.37 | 77.25 | 91.12 | 87.69 | 58.57 | 74.94 | 65.92 | 44.35 | 74.47 | 36.91 | 41.41 | 780.65 | 3868.07 | 23.23 |
| | Water Body | 1915.67 | 3.73 | | | 84.88 | 132.00 | 228.69 | 322.01 | 366.01 | 340.32 | 257.19 | 151.02 | 94.48 | 136.11 | 82.96 | 64.49 | 2260.18 | | |
| | Salt land | 1767.03 | 3.44 | | | 43.38 | 60.28 | 85.72 | 118.01 | 109.81 | 84.67 | 83.74 | 66.74 | 57.95 | 59.03 | 28.76 | 29.14 | 827.24 | | |
| Others | Rangeland | 28123.12 | 54.69 | 28934.35 | 56.27 | 260.93 | 413.70 | 645.26 | 949.17 | 1208.16 | 939.22 | 866.22 | 713.65 | 540.28 | 451.51 | 160.06 | 155.38 | 7303.53 | 7674.43 | 46.08 |
| | Built-up | 811.23 | 1.58 | | | 17.90 | 21.13 | 31.36 | 30.56 | 32.42 | 33.82 | 47.50 | 47.22 | 42.57 | 33.37 | 19.85 | 13.20 | 370.90 | | |
| Total | Lake Urmia Land Cover | 51421.07 | 100 | 51421.07 | 100 | 705.43 | 909.64 | 1271.56 | 1920.34 | 2466.37 | 2219.87 | 2162.44 | 1749.24 | 1280.21 | 1116.88 | 450.76 | 400.11 | 16652.82 | 16652.82 | 100 |

Table S3: Summary statistics (mean, median, and standard deviation) for precipitation, relative humidity, vapor pressure, and dewpoint temperature during the entire study period (1986-2017) and its sub-periods (1986-1995, 1996-2017), also highlights percentage changes in these metrics from 1986-1995 to 1996-2017

| | Period | Variable | Station | Precipitation (mm) | | | Humidity (%) | | | Vapor Pressure (mBar) | | | Dewpoint Temperature (°C) | | |
|----------------------------------------|---------------------|----------|---------|--------------------|--------|--------|--------------|--------|--------|-----------------------|--------|--------|---------------------------|--------|--------|
| | | Season | | Mean | Median | SD | Mean | Median | SD | Mean | Median | SD | Mean | Median | SD |
| Entire Study Timeframe | 1986-2017 | Spring | Saqez | 121.43 | 119.15 | 52.7 | 52.93 | 53.91 | 7.01 | 7.85 | 7.83 | 0.89 | 2.92 | 2.92 | 1.59 |
| | | | Sarab | 100.48 | 88.17 | 43.55 | 56.27 | 57.43 | 5.34 | 7.52 | 7.52 | 0.68 | 2.11 | 2.18 | 1.33 |
| | | Summer | Saqez | 9.41 | 7.15 | 9.82 | 32.29 | 30.77 | 4.87 | 8.7 | 8.49 | 0.98 | 4.19 | 3.97 | 1.58 |
| | | | Sarab | 28.71 | 25.35 | 16.62 | 51.17 | 51.05 | 3.62 | 10.75 | 10.88 | 0.53 | 7.48 | 7.69 | 0.85 |
| | | Autumn | Saqez | 137.91 | 133.55 | 79.78 | 57.44 | 58.04 | 6.21 | 5.98 | 5.92 | 0.57 | -1.13 | -1.1 | 1.42 |
| | | | Sarab | 60.23 | 64.75 | 29.02 | 63.8 | 63.15 | 5.38 | 5.73 | 5.71 | 0.46 | -1.81 | -1.66 | 1.26 |
| | | Winter | Saqez | 171.2 | 176.35 | 64.84 | 71.94 | 72.15 | 3.38 | 4.46 | 4.46 | 0.53 | -5.25 | -5.28 | 1.96 |
| | | | Sarab | 45.19 | 42.38 | 17.13 | 70.29 | 71.8 | 6.44 | 3.73 | 3.69 | 0.36 | -7.49 | -7.35 | 1.45 |
| Normal Lake Condition | 1986-1995 | Spring | Saqez | 136.51 | 119.15 | 63.56 | 52.91 | 50.34 | 9.3 | 8.28 | 7.78 | 1.08 | 3.62 | 2.77 | 1.83 |
| | | | Sarab | 94.28 | 76.68 | 41.74 | 57.17 | 58.58 | 7.2 | 7.83 | 7.63 | 0.92 | 2.62 | 2.35 | 1.81 |
| | | Summer | Saqez | 5.06 | 2.6 | 7.71 | 35.07 | 35.559 | 6.53 | 9.502 | 10.12 | 1.14 | 5.4 | 6.36 | 1.76 |
| | | | Sarab | 26.28 | 21.15 | 20.28 | 52.23 | 52.74 | 4.23 | 11.14 | 11.15 | 0.36 | 8.08 | 8.07 | 0.51 |
| | | Autumn | Saqez | 173.05 | 149.1 | 108 | 57.63 | 57.36 | 5.97 | 6.11 | 6.22 | 0.59 | -0.82 | -0.38 | 1.35 |
| | | | Sarab | 58.77 | 69.4 | 30.84 | 62.85 | 61.32 | 4.99 | 5.77 | 5.77 | 0.44 | -1.71 | -1.55 | 1.16 |
| | | Winter | Saqez | 190.33 | 195.15 | 79.85 | 72.46 | 73.73 | 3.57 | 4.36 | 4.26 | 0.71 | -5.6 | -5.79 | 2.66 |
| | | | Sarab | 44.79 | 47.78 | 18.75 | 69.4 | 72.05 | 9.63 | 3.59 | 3.53 | 0.37 | -8.03 | -8.21 | 1.56 |
| Water Level Reduction | 1996-2017 | Spring | Saqez | 114.58 | 116.2 | 45.3 | 52.95 | 54.32 | 5.66 | 7.66 | 7.86 | 0.71 | 2.6 | 3.04 | 1.35 |
| | | | Sarab | 103.3 | 90.59 | 44.07 | 55.85 | 56.76 | 4.17 | 7.38 | 7.41 | 0.49 | 1.87 | 1.86 | 0.97 |
| | | Summer | Saqez | 11.39 | 9.75 | 10.03 | 31.03 | 30.61 | 3.17 | 8.33 | 8.38 | 0.61 | 3.65 | 3.8 | 1.12 |
| | | | Sarab | 29.82 | 27.84 | 14.53 | 50.7 | 50.78 | 3.19 | 10.58 | 10.63 | 0.5 | 7.2 | 7.43 | 0.83 |
| | | Autumn | Saqez | 121.94 | 128.9 | 56.06 | 57.35 | 58.04 | 6.32 | 5.91 | 5.83 | 0.55 | -1.27 | -1.29 | 1.42 |
| | | | Sarab | 60.89 | 62.13 | 28.13 | 64.23 | 63.55 | 5.49 | 5.71 | 5.71 | 0.48 | -1.85 | -1.68 | 1.31 |
| | | Winter | Saqez | 162.51 | 160.2 | 54.55 | 71.71 | 71.61 | 3.26 | 4.502 | 4.51 | 0.41 | -5.1 | -5.22 | 1.51 |
| | | | Sarab | 45.36 | 42.16 | 16.33 | 70.7 | 71.65 | 4.21 | 3.81 | 3.87 | 0.34 | -7.23 | -7 | 1.32 |
| (Post1995 - Pre1995) * 100/ Pre1995 | Percent changes (%) | Spring | Saqez | -16.06 | -2.48 | -28.73 | 0.08 | 7.91 | -39.14 | -7.49 | 1.03 | -34.26 | -28.18 | 9.75 | -26.23 |
| | | | Sarab | 9.57 | 18.14 | 5.58 | -2.31 | -3.11 | -42.08 | -5.75 | -2.88 | -46.74 | -28.63 | -20.85 | -46.41 |
| | | Summer | Saqez | 125.10 | 275 | 30.09 | -11.52 | -13.92 | -51.45 | -12.33 | -17.19 | -46.49 | -32.41 | -40.25 | -36.36 |
| | | | Sarab | 13.47 | 31.63 | -28.35 | -2.93 | -3.72 | -24.59 | -5.03 | -4.66 | 38.89 | -10.89 | -7.93 | 62.75 |
| | | Autumn | Saqez | -29.53 | -13.55 | -48.09 | -0.49 | 1.19 | 5.86 | -3.27 | -6.27 | -6.78 | 54.88 | 239.47 | 5.19 |
| | | | Sarab | 3.61 | -10.48 | -8.79 | 2.20 | 3.64 | 10.02 | -1.04 | -1.04 | 9.09 | 8.19 | 8.39 | 12.93 |
| | | Winter | Saqez | -14.62 | -17.91 | -31.68 | -1.04 | -2.88 | -8.68 | 3.26 | 5.87 | -42.25 | -8.93 | -9.84 | -43.23 |
| | | | Sarab | 1.27 | -11.76 | -12.91 | 1.87 | -0.56 | -56.28 | 6.13 | 9.63 | -8.11 | -9.96 | -14.74 | -15.38 |

Table S4: Comparative analysis of meteorological parameters between Sazez and Sarab stations using statistical indicators, P-values, and T-statistics

| | Period | Variable | Station | Precipitation (mm) | | | Humidity (%) | | | Vapor Pressure (mBar) | | | Dewpoint Temperature (°C) | | |
|------------------------|-----------|----------|----------------|--------------------|------------------------|-------------------------|--------------|------------------------|-------------------------|-----------------------|------------------------|-------------------------|---------------------------|------------------------|-------------------------|
| | | Season | | T-Statistic | P-Value | Significance Difference | T-Statistic | P-Value | Significance Difference | T-Statistic | P-Value | Significance Difference | T-Statistic | P-Value | Significance Difference |
| Entire Study Timeframe | 1986-2017 | Spring | Sazez Sarab | 1.706219 | 0.092972 | No | -2.103337 | 0.0395 | Yes | 1.631673 | 0.107818 | No | 2.176709 | 0.033319 | Yes |
| | | Summer | Sazez Sarab | -5.56553 | 5.95×10^{-7} | Yes | -17.30485 | 2.03×10^{-25} | Yes | -10.2334 | 6.07×10^{-15} | Yes | -10.1542 | 8.23×10^{-15} | Yes |
| | | Autumn | Sazez Sarab | 5.094555 | 3.52×10^{-6} | Yes | -4.30965 | 5.95×10^{-5} | Yes | 1.866507 | 0.066701 | No | 1.977606 | 0.052423 | No |
| | | Winter | Sazez Sarab | 10.46129 | 2.54×10^{-15} | Yes | 1.260456 | 0.21223 | No | 6.223878 | 4.64×10^{-8} | Yes | 5.090623 | 3.57×10^{-6} | Yes |
| Normal Lake Condition | 1986-1995 | Spring | Sazez Sarab | 1.665846 | 0.113051 | No | -1.087808 | 0.29103 | No | 0.940677 | 0.359324 | No | 1.163121 | 0.259969 | No |
| | | Summer | Sazez Sarab | -2.93458 | 0.008858 | Yes | -6.602086 | 3.36×10^{-6} | Yes | -4.0987 | 0.000674 | Yes | -4.37369 | 0.000366 | Yes |
| | | Autumn | Sazez Sarab | 3.052667 | 0.006852 | Yes | -2.010628 | 0.05959 | No | 1.412758 | 0.174785 | No | 1.507469 | 0.149041 | No |
| | | Winter | Sazez Sarab | 5.323307 | 4.64×10^{-5} | Yes | 0.891435 | 0.38446 | No | 2.903087 | 0.009482 | Yes | 2.358687 | 0.029847 | Yes |
| Water Level Reduction | 1996-2017 | Spring | Sazez Sarab | 0.8179 | 0.418031 | No | -1.891045 | 0.06553 | No | 1.47182 | 0.148523 | No | 2.003667 | 0.051585 | No |
| | | Summer | Sazez Sarab | -4.78182 | 2.15×10^{-5} | Yes | -20.0181 | 4.24×10^{-15} | Yes | -12.8728 | 3.60×10^{-16} | Yes | -11.6054 | 1.10×10^{-14} | Yes |
| | | Autumn | Sazez Sarab | 4.460561 | 6.01×10^{-5} | Yes | -3.767079 | 0.00051 | Yes | 1.270876 | 0.210767 | No | 1.361646 | 0.18057 | No |
| | | Winter | Sazez Sarab | 9.426258 | 6.35×10^{-12} | Yes | 0.867961 | 0.39035 | No | 5.897001 | 5.59×10^{-7} | Yes | 4.880801 | 1.57×10^{-5} | Yes |

Table S5: Correlation coefficient matrix illustrating the relationships between climate variables and Urmia Lake water level. Green indicates a positive correlation, while red signifies a lack of correlation. (Abbreviations explained: ULWL - Urmia Lake Water Level, DEW - Dewpoint Temperature, P - Precipitation, HU - Humidity, VP - Vapor Pressure, and Rainy Day - Number of Rainy Days)

| | | <i>Saqez Station</i> | | | | | | <i>Sarab Station</i> | | | | | |
|--------|------------|----------------------|-------|-------|-------|-------|------------|----------------------|-------|-------|-------|-------|------------|
| | | ULWL | DEW | P | HU | VP | Rainy Days | ULWL | DEW | P | HU | VP | Rainy Days |
| Spring | ULWL | 1 | 0.12 | 0.26 | 0.10 | 0.16 | 0.01 | 1 | 0.20 | 0.10 | 0.18 | 0.22 | 0.03 |
| | DEW | 0.12 | 1 | 0.49 | 0.55 | 0.99 | 0.41 | 0.20 | 1 | 0.19 | 0.68 | 0.98 | 0.07 |
| | P | 0.26 | 0.49 | 1 | 0.84 | 0.49 | 0.80 | 0.10 | 0.19 | 1 | 0.66 | 0.19 | 0.70 |
| | HU | 0.10 | 0.55 | 0.84 | 1 | 0.54 | 0.84 | 0.18 | 0.68 | 0.66 | 1 | 0.64 | 0.54 |
| | VP | 0.16 | 0.99 | 0.49 | 0.54 | 1 | 0.39 | 0.22 | 0.98 | 0.19 | 0.64 | 1 | 0.09 |
| | Rainy Days | 0.01 | 0.41 | 0.80 | 0.84 | 0.39 | 1 | 0.03 | 0.07 | 0.70 | 0.54 | 0.09 | 1 |
| Summer | ULWL | 1 | 0.35 | -0.10 | 0.38 | 0.40 | -0.02 | 1 | 0.50 | 0.14 | 0.35 | 0.43 | -0.25 |
| | DEW | 0.35 | 1 | 0.01 | 0.84 | 0.99 | -0.01 | 0.50 | 1 | 0.19 | 0.55 | 0.89 | 0.16 |
| | P | -0.10 | 0.01 | 1 | 0.00 | -0.01 | 0.78 | 0.14 | 0.19 | 1 | 0.05 | 0.13 | 0.53 |
| | HU | 0.38 | 0.84 | 0.00 | 1 | 0.85 | 0.02 | 0.35 | 0.55 | 0.05 | 1 | 0.45 | 0.13 |
| | VP | 0.40 | 0.99 | -0.01 | 0.85 | 1 | -0.05 | 0.43 | 0.89 | 0.13 | 0.45 | 1 | 0.04 |
| | Rainy Days | -0.02 | -0.01 | 0.78 | 0.02 | -0.05 | 1 | -0.25 | 0.16 | 0.53 | 0.13 | 0.04 | 1 |
| Autumn | ULWL | 1 | 0.07 | -0.04 | -0.09 | 0.03 | -0.10 | 1 | 0.10 | -0.21 | -0.14 | 0.01 | -0.29 |
| | DEW | 0.07 | 1 | 0.53 | 0.75 | 0.98 | 0.61 | 0.10 | 1 | 0.40 | 0.43 | 0.97 | 0.45 |
| | P | -0.04 | 0.53 | 1 | 0.73 | 0.57 | 0.67 | -0.21 | 0.40 | 1 | 0.72 | 0.47 | 0.77 |
| | HU | -0.09 | 0.75 | 0.73 | 1 | 0.76 | 0.78 | -0.14 | 0.43 | 0.72 | 1 | 0.45 | 0.70 |
| | VP | 0.03 | 0.98 | 0.57 | 0.76 | 1 | 0.64 | 0.01 | 0.97 | 0.47 | 0.45 | 1 | 0.50 |
| | Rainy Days | -0.10 | 0.61 | 0.67 | 0.78 | 0.64 | 1 | -0.29 | 0.45 | 0.77 | 0.70 | 0.50 | 1 |
| Winter | ULWL | 1 | -0.17 | 0.42 | 0.29 | -0.20 | 0.12 | 1 | -0.26 | 0.23 | 0.05 | -0.27 | -0.02 |
| | DEW | -0.17 | 1 | -0.18 | -0.43 | 0.99 | -0.36 | -0.26 | 1 | 0.26 | 0.00 | 0.98 | 0.09 |
| | P | 0.42 | -0.18 | 1 | 0.46 | -0.19 | 0.78 | 0.23 | 0.26 | 1 | 0.40 | 0.32 | 0.59 |
| | HU | 0.29 | -0.43 | 0.46 | 1 | -0.43 | 0.39 | 0.05 | 0.00 | 0.40 | 0 | 0.08 | 0.47 |
| | VP | -0.20 | 0.99 | -0.19 | -0.43 | 1 | -0.36 | -0.27 | 0.98 | 0.32 | 0.08 | 1 | 0.12 |
| | Rainy Days | 0.12 | -0.36 | 0.78 | 0.39 | -0.36 | 1 | -0.02 | 0.09 | 0.59 | 0.47 | 0.12 | 1 |
| Yearly | ULWL | 1 | 0.12 | 0.30 | 0.22 | 0.22 | 0.02 | 1 | 0.20 | 0.08 | 0.13 | 0.28 | -0.23 |
| | DEW | 0.12 | 1 | 0.30 | 0.43 | 0.96 | 0.03 | 0.20 | 1 | 0.36 | 0.23 | 0.89 | 0.07 |
| | P | 0.30 | 0.30 | 1 | 0.71 | 0.32 | 0.66 | 0.08 | 0.36 | 1 | 0.54 | 0.19 | 0.67 |
| | HU | 0.22 | 0.43 | 0.71 | 1 | 0.51 | 0.57 | 0.13 | 0.23 | 0.54 | 1 | 0.15 | 0.43 |
| | VP | 0.22 | 0.96 | 0.32 | 0.51 | 1 | 0.02 | 0.28 | 0.89 | 0.19 | 0.15 | 1 | -0.05 |
| | Rainy Days | 0.02 | 0.03 | 0.66 | 0.57 | 0.02 | 1 | -0.23 | 0.07 | 0.67 | 0.43 | -0.05 | 1 |

Table S6: Comparative analysis of meteorological parameters before and after the identified change point in 1995 using statistical indicators, P-Values, and T-Statistics. (Abbreviations explained: ULWL - Urmia Lake Water Level, DEW - Dewpoint Temperature, P - Precipitation, HU - Humidity, VP - Vapor Pressure, and Rainy Day - Number of Rainy Days)

| <i>Saqez Station</i> | | | | <i>Sarab Station</i> | | | |
|----------------------|-------------------|-------------|---------|----------------------|-------------|---------|--------------------|
| | | T-Statistic | P-Value | Significance Trend | T-Statistic | P-Value | Significance Trend |
| Spring | ULWL | 5.581 | 0.000 | Yes | 5.581 | 0.000 | Yes |
| | DEW | 1.499 | 0.157 | No | 1.169 | 0.267 | No |
| | P | 0.938 | 0.365 | No | -0.533 | 0.601 | No |
| | HU | -0.012 | 0.991 | No | 0.515 | 0.616 | No |
| | VP | 1.571 | 0.141 | No | 1.383 | 0.194 | No |
| | Rainy Day | -0.517 | 0.611 | No | 0.003 | 0.998 | No |
| Summer | ULWL | 5.581 | 0.000 | Yes | 5.581 | 0.000 | Yes |
| | DEW | 2.753 | 0.017 | Yes | 3.517 | 0.002 | Yes |
| | P | -1.876 | 0.074 | No | -0.473 | 0.644 | No |
| | HU | 1.768 | 0.105 | No | 0.961 | 0.354 | No |
| | VP | 2.879 | 0.015 | Yes | 3.459 | 0.002 | Yes |
| | Rainy Days | -1.866 | 0.079 | No | -1.726 | 0.097 | No |
| Autumn | ULWL | 5.581 | 0.000 | Yes | 5.581 | 0.000 | Yes |
| | DEW | 0.829 | 0.418 | No | 0.275 | 0.786 | No |
| | P | 1.344 | 0.206 | No | -0.177 | 0.862 | No |
| | HU | 0.115 | 0.909 | No | -0.675 | 0.508 | No |
| | VP | 0.857 | 0.404 | No | 0.303 | 0.766 | No |
| | Rainy Days | 0.373 | 0.713 | No | 0.003 | 0.998 | No |
| Winter | ULWL | 5.581 | 0.000 | Yes | 5.581 | 0.000 | Yes |
| | DEW | -0.535 | 0.603 | No | -1.339 | 0.201 | No |
| | P | 0.954 | 0.358 | No | -0.080 | 0.938 | No |
| | HU | 0.539 | 0.597 | No | -0.388 | 0.706 | No |
| | VP | -0.528 | 0.608 | No | -1.485 | 0.157 | No |
| | Rainy Days | 0.405 | 0.693 | No | 0.132 | 0.897 | No |
| Yearly | ULWL | 5.581 | 0.000 | Yes | 5.581 | 0.000 | Yes |
| | DEW | 1.374 | 0.198 | No | 1.176 | 0.254 | No |
| | P | 1.678 | 0.121 | No | -0.688 | 0.501 | No |
| | HU | 0.763 | 0.461 | No | 0.022 | 0.983 | No |
| | VP | 1.965 | 0.076 | No | 2.217 | 0.042 | Yes |
| | Rainy Days | -0.076 | 0.941 | No | -0.314 | 0.759 | No |

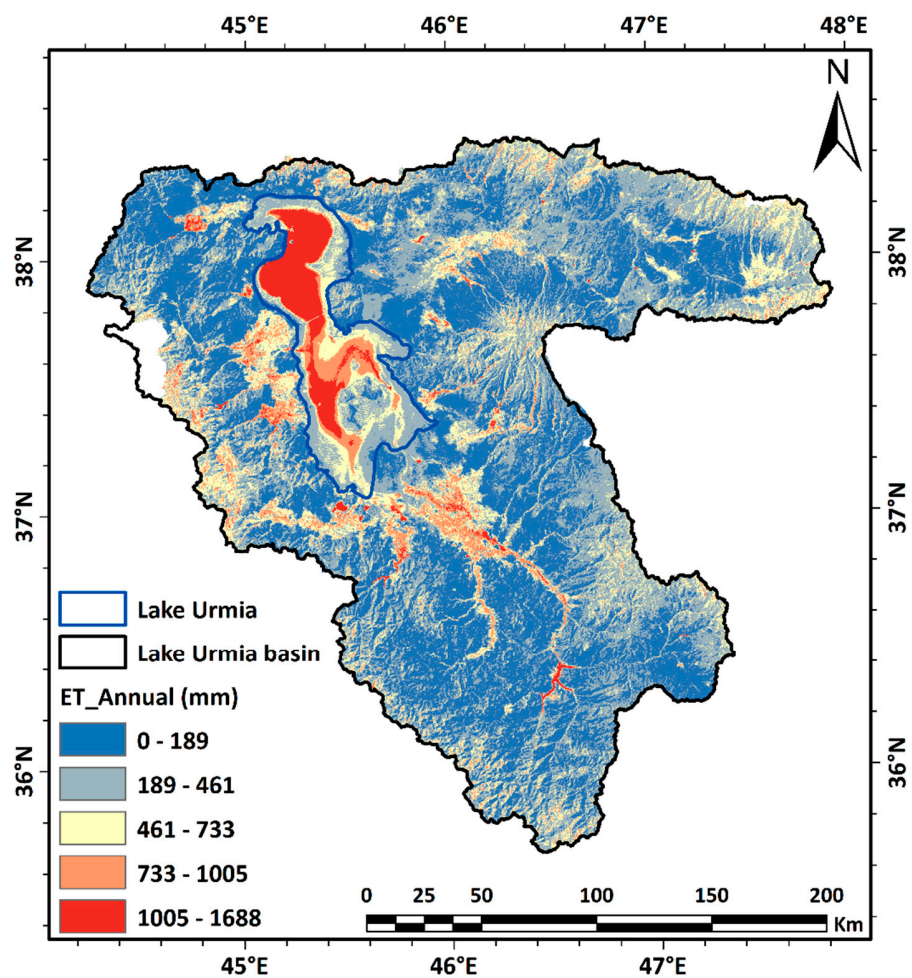


Figure S1: Annual average actual evapotranspiration (mm) for the years 2013-2015 (Data source: Urmia Lake Research Programme, <https://abopa.ir/en/ulrp5/> (accessed on October 1, 2023)).

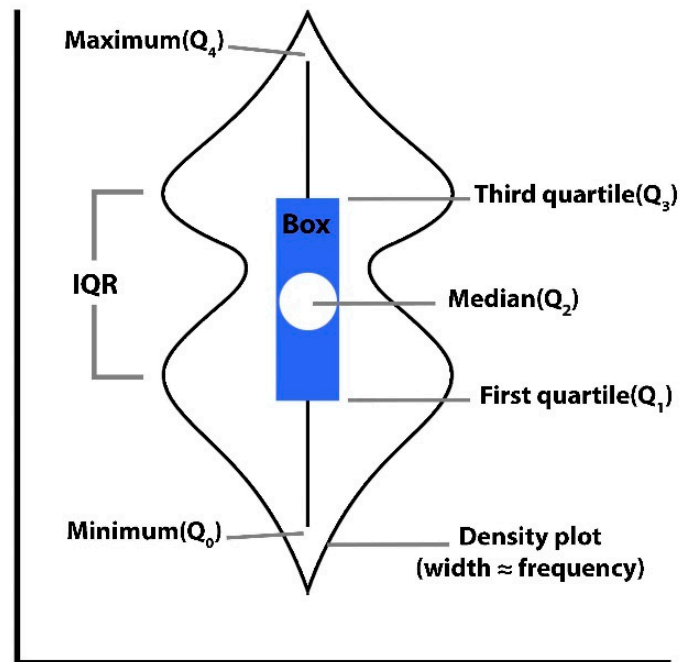
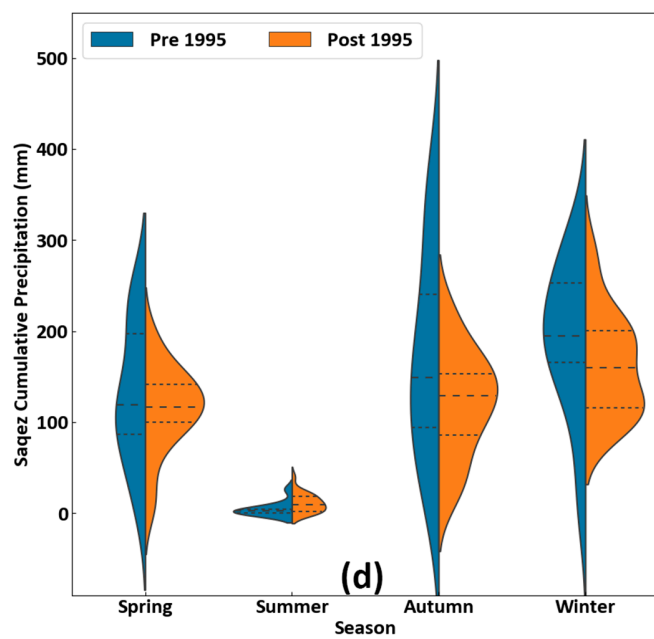
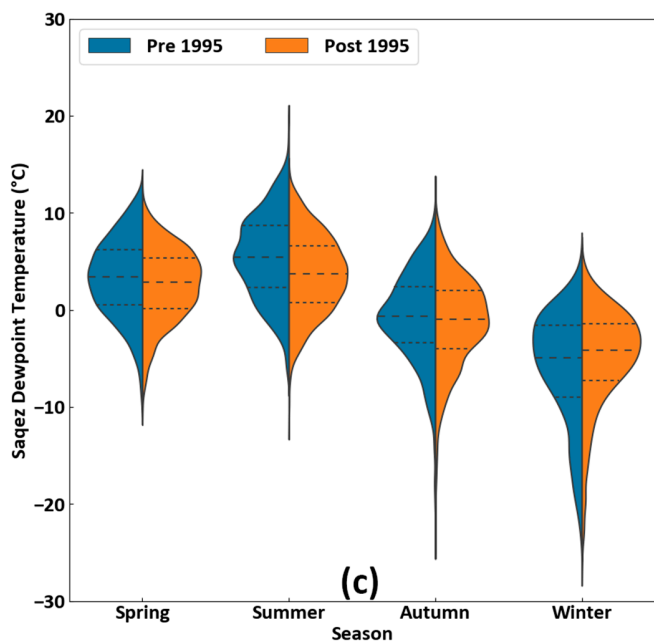
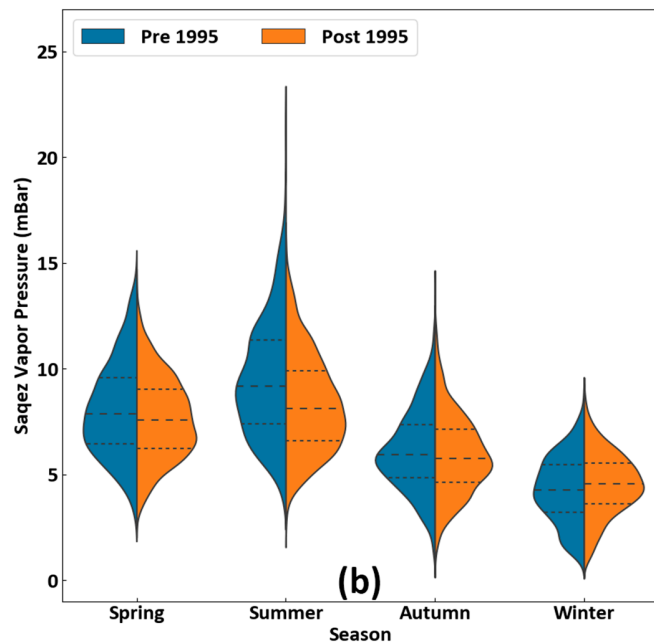
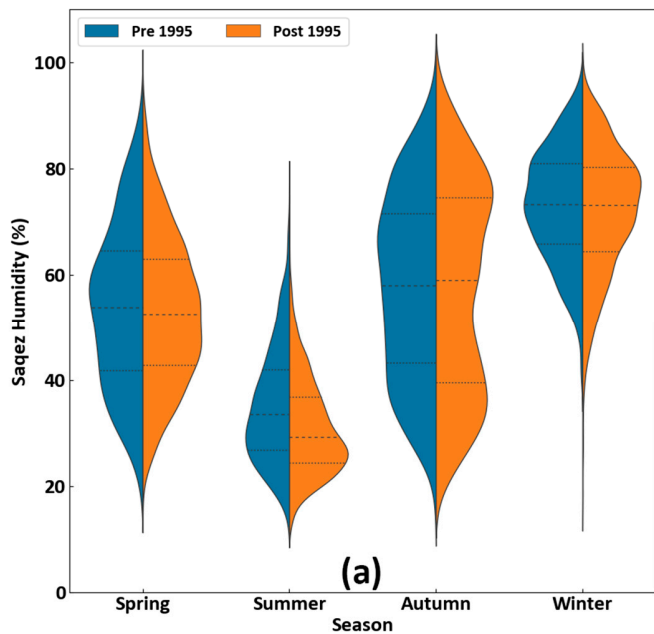


Figure S2: Illustration depicting the violin plot along with its relevant details.



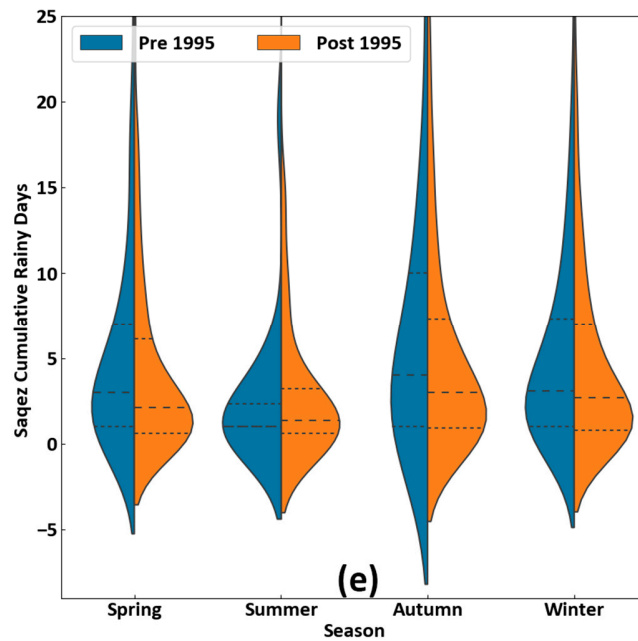
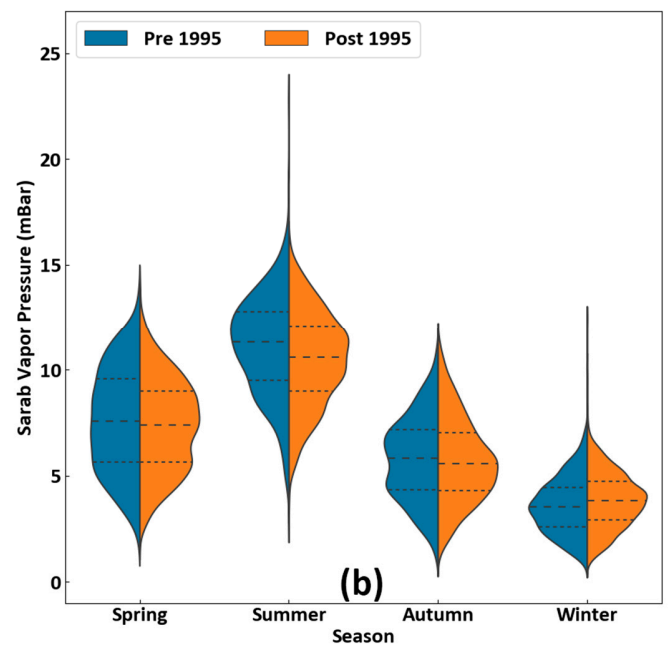
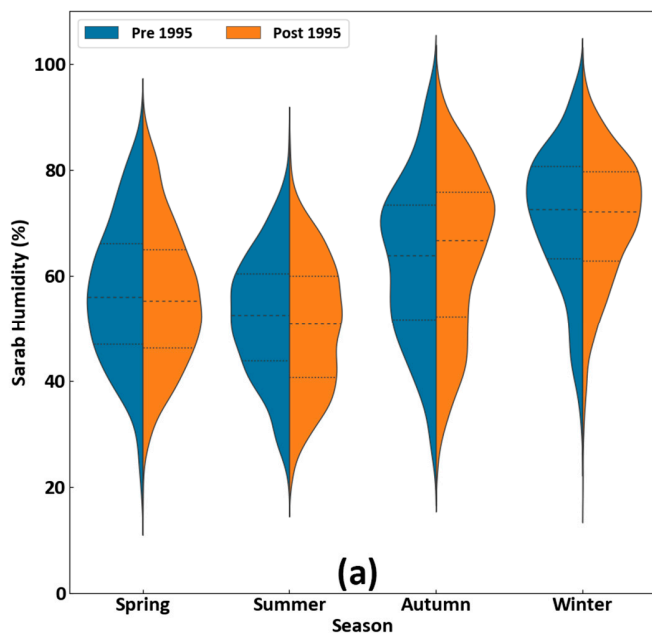


Figure S3: Violin plots illustrating seasonal variations in (a) seasonal average relative humidity, (b) seasonal average vapor pressure, (c) seasonal average dewpoint temperature, (d) cumulative precipitation, and (e) cumulative rainy days at the Saez synoptic station, contrasting the periods before and after 1995.



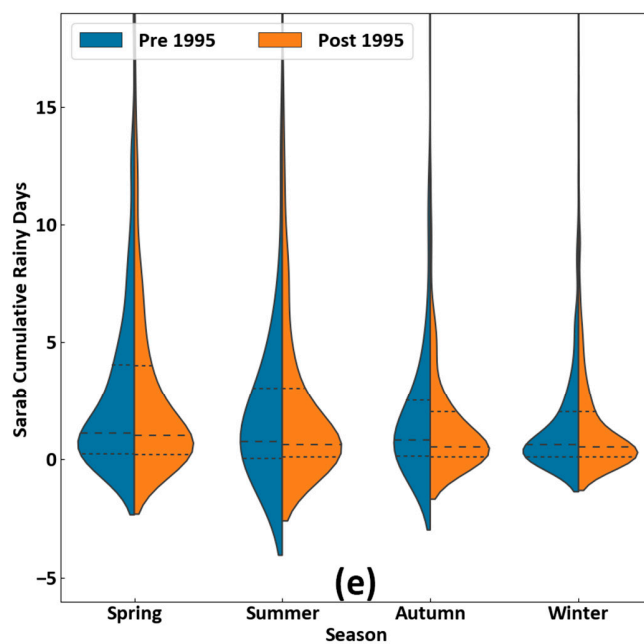
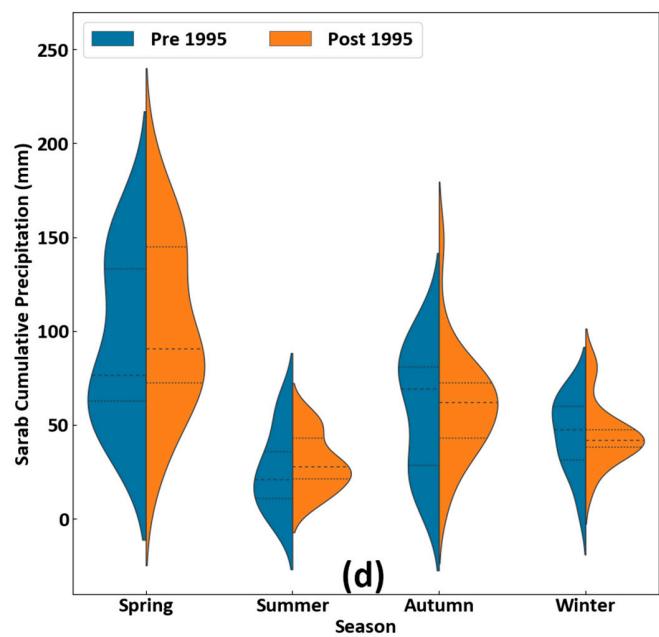
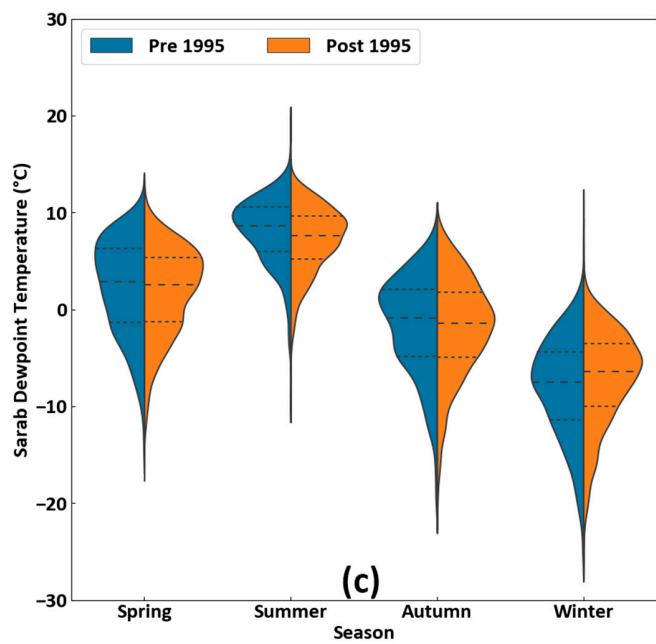


Figure S4: Violin plots illustrating seasonal variations in (a) seasonal average relative humidity, (b) seasonal average vapor pressure, (c) seasonal average dewpoint temperature, (d) cumulative precipitation, and (e) cumulative rainy days at the Sarab synoptic station, contrasting the periods before and after 1995.