



Supplement of

FZStats v1.0: a raster statistics toolbox for simultaneous management of spatial stratified heterogeneity and positional dependence in Python

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```

def _generate_mask_matrix(self):
    """
    Generates a circular mask matrix where points within radius are marked True.
    Returns both the mask and its center coordinates.
    """
    # Determine mask dimensions
    mask_size = 2 * self.radius + 1

    # Initialize boolean matrix with False values
    mask = np.zeros((mask_size, mask_size), dtype=bool)

    # Center point coordinates of the mask
    mask_center = (self.radius, self.radius)

    # Pre-compute squared radius to avoid repeated calculation
    radius_sq = self.grid_radius ** 2

    # Iterate through each pixel in the mask
    for y in range(mask_size):
        for x in range(mask_size):
            # Check if pixel is within circular radius using distance formula
            if (y - mask_center[0]) ** 2 + (x - mask_center[1]) ** 2 <= radius_sq:
                mask[y, x] = True

    return mask, mask_center

```

Listing S1. Construction of the circular neighborhood window mask matrix

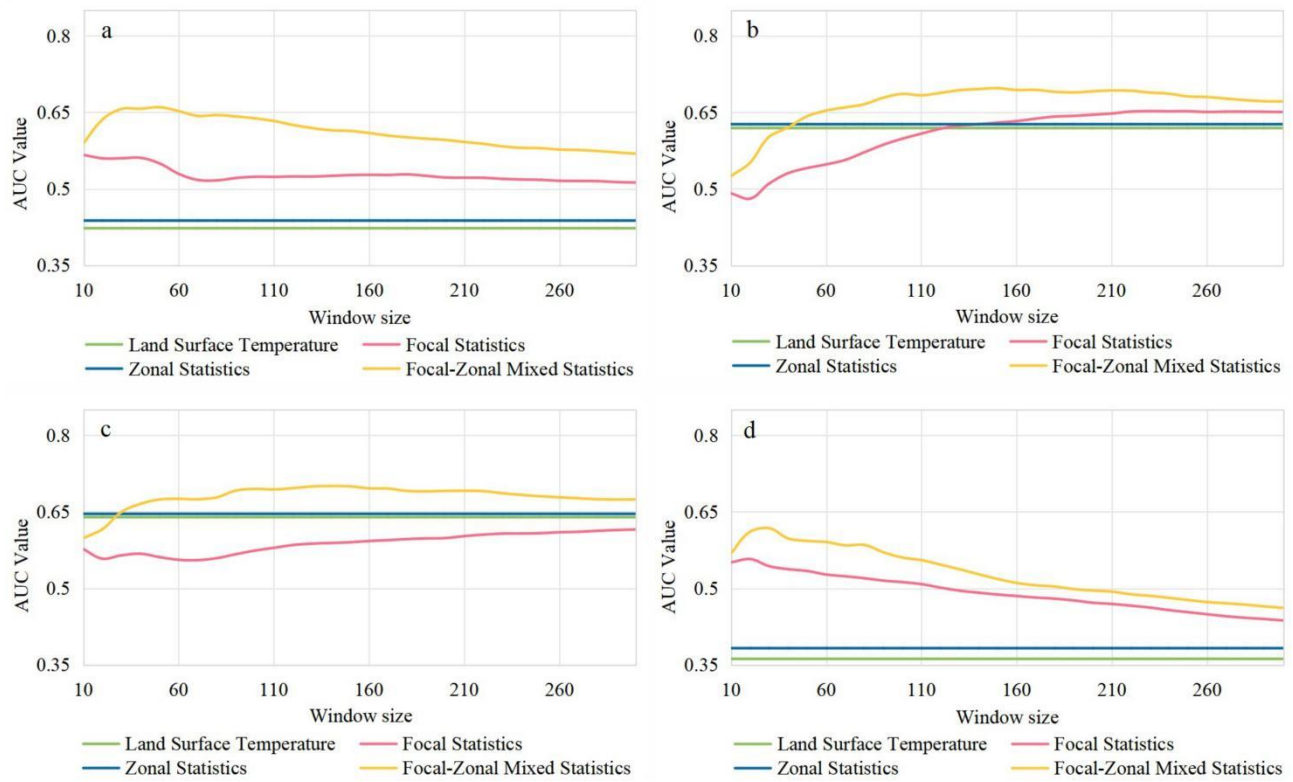


Figure S1. Variations in AUC values with increasing local window radius (measured in pixel units) for Land Surface Temperature (LST) and its three enhancement indices derived from Focal Statistics, Zonal Statistics, and Focal–Zonal Mixed Statistics. The geothermal wells are represented as circles with an area of 0.035 km². Panels (a) through (d) correspond to the LST data acquired in the spring, summer, autumn, and winter of 2015, respectively.

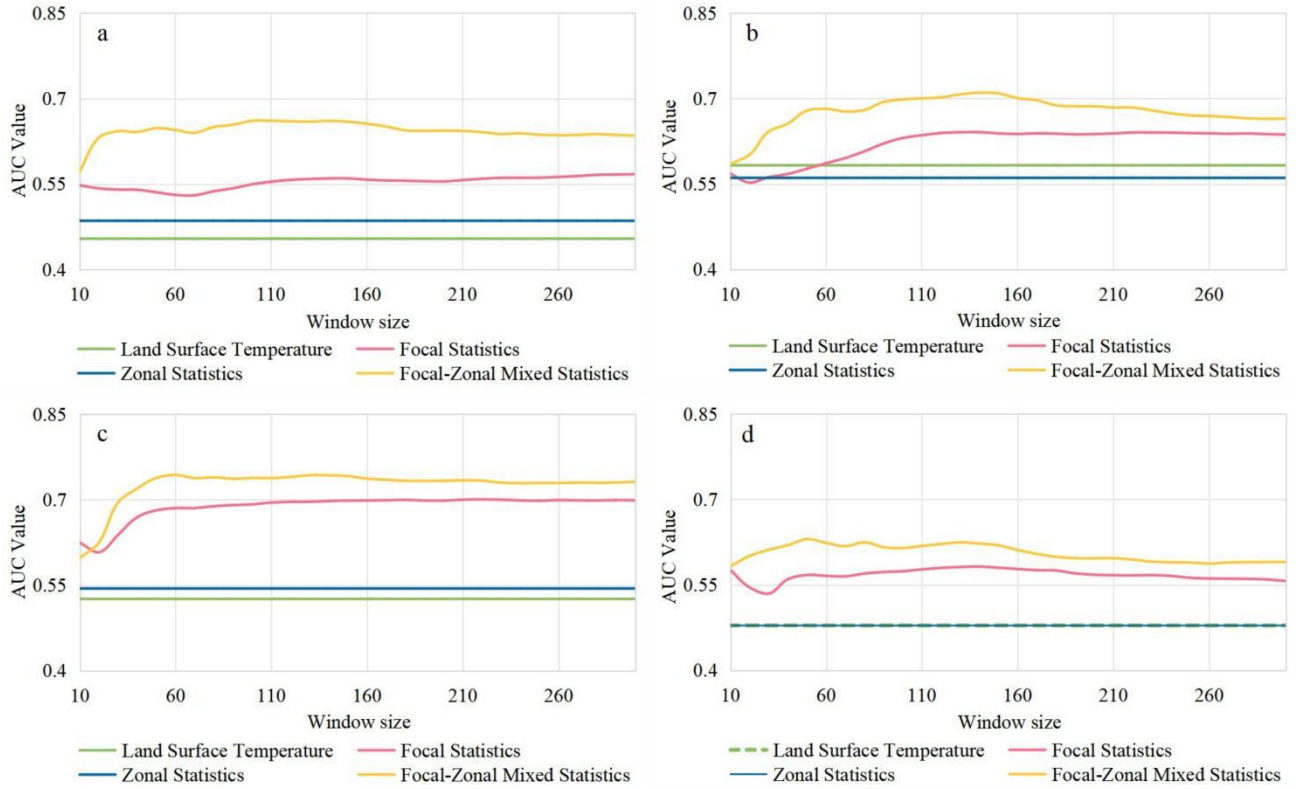


Figure S2. Variations in AUC values with increasing local window radius (measured in pixel units) for Land Surface Temperature (LST) and its three enhancement indices derived from Focal Statistics, Zonal Statistics, and Focal–Zonal Mixed Statistics. The geothermal wells are represented as circles with an area of 0.035 km². Panels (a) through (d) correspond to the LST data acquired in the spring, summer, autumn, and winter of 2019, respectively.

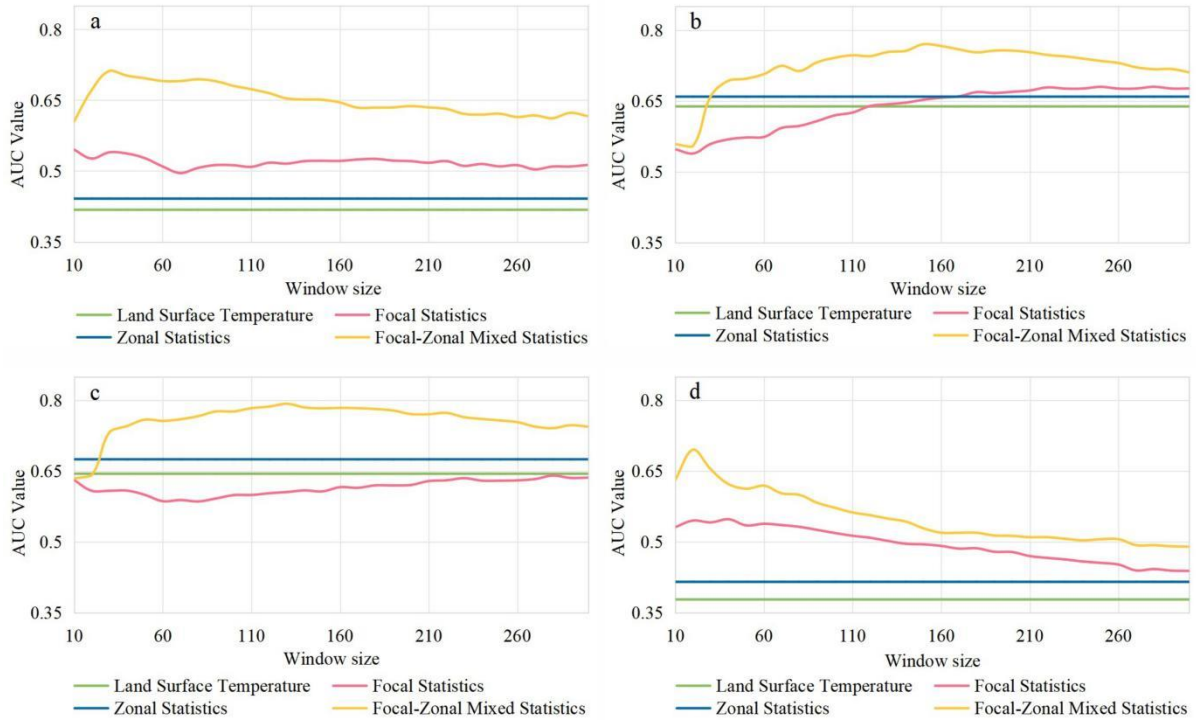


Figure S3. Variations in AUC values with increasing local window radius (measured in pixel units) for Land Surface Temperature (LST) and its three enhancement indices derived from Focal Statistics, Zonal Statistics, and Focal–Zonal Mixed Statistics. The geothermal wells are represented as circles with an area of 0.0009 km² (a single pixel). Panels (a) through (d) correspond to the LST data acquired in the spring, summer, autumn, and winter of 2015, respectively.

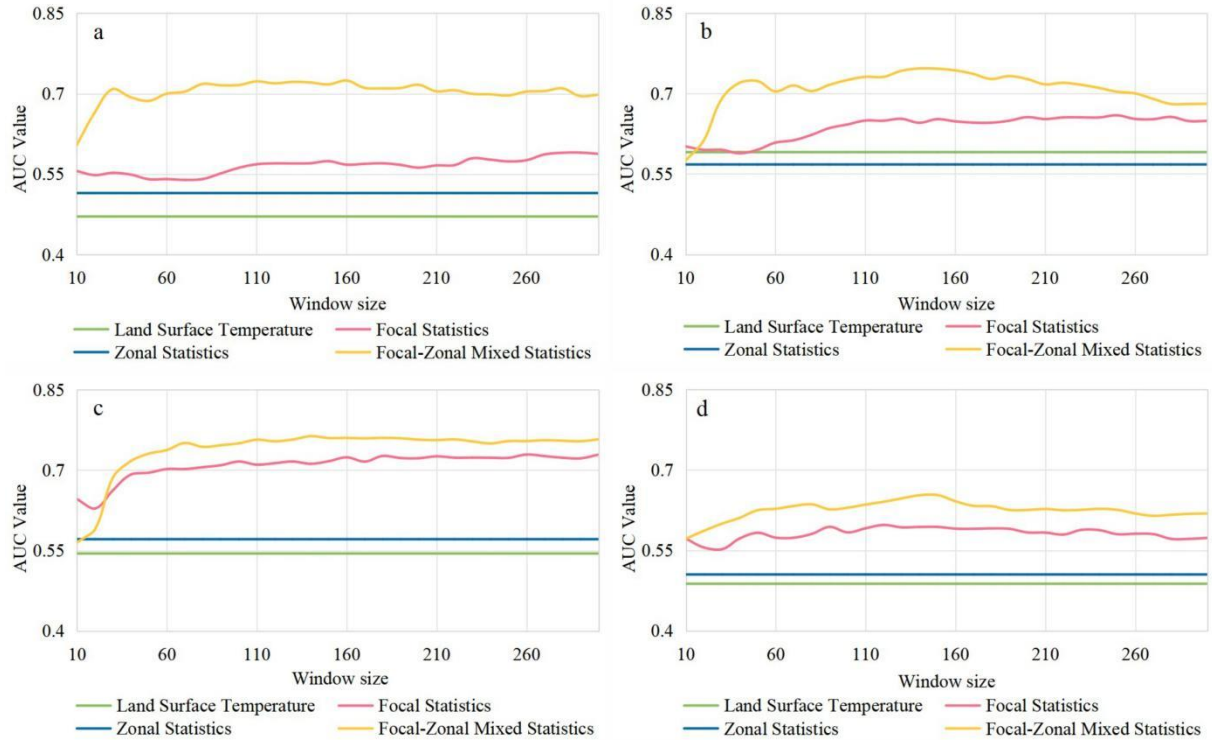


Figure S4. Variations in AUC values with increasing local window radius (measured in pixel units) for Land Surface Temperature (LST) and its three enhancement indices derived from Focal Statistics, Zonal Statistics, and Focal–Zonal Mixed Statistics. The geothermal wells are represented as circles with an area of 0.0009 km² (a single pixel). Panels (a) through (d) correspond to the LST data acquired in the spring, summer, autumn, and winter of 2019, respectively.

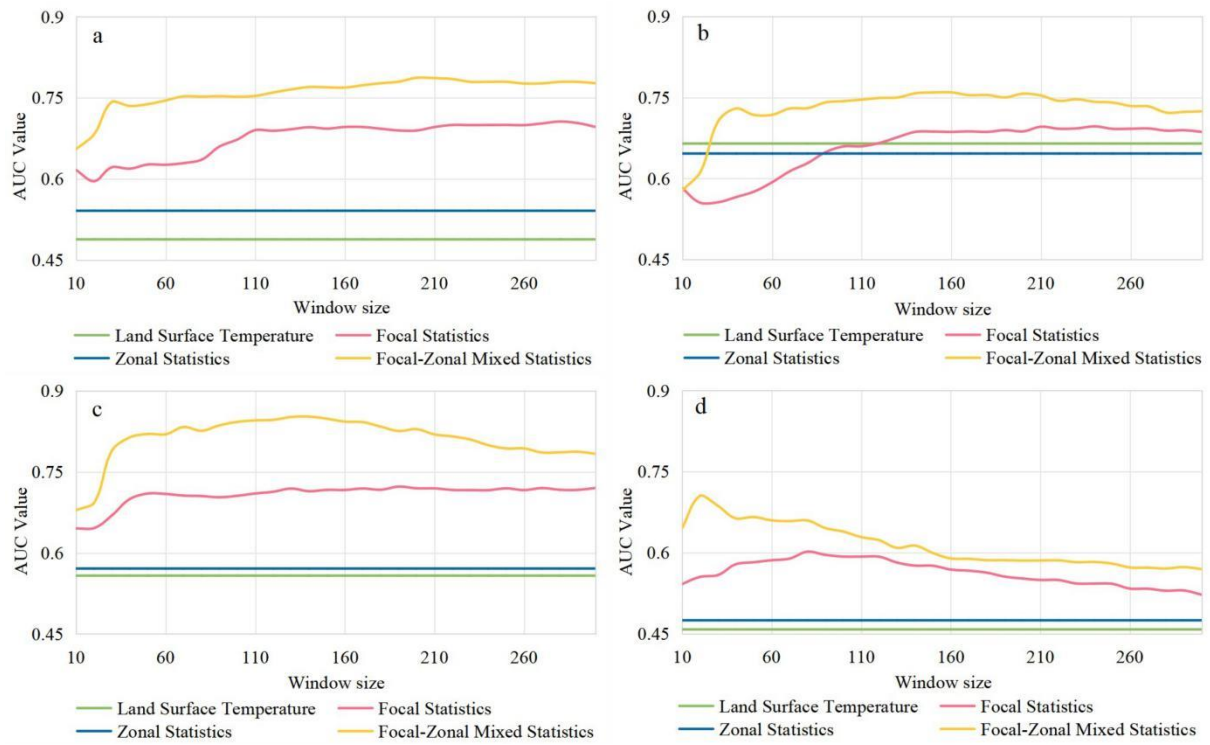


Figure S5. Variations in AUC values with increasing local window radius (measured in pixel units) for Land Surface Temperature (LST) and its three enhancement indices derived from Focal Statistics, Zonal Statistics, and Focal–Zonal Mixed Statistics. The geothermal wells are represented as circles with an area of 0.0009 km² (a single pixel). Panels (a) through (d) correspond to the LST data acquired in the spring, summer, autumn, and winter of 2023, respectively.