

Impact of Meteorological Factors on Thermokarst Lake Changes in the Beilu River Basin, Qinghai-Tibet Plateau, China (2000–2016)

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Supplementary information

Method

The supporting images are made by using ENVI application. The general process of outputting result is calculating the MNDWI and using the ROI tool to separate the Thermokarst lakes from other water bodies. Besides, this article also selects a typical lake using ROI tool to study the law of lake changes. The total results are shown below.

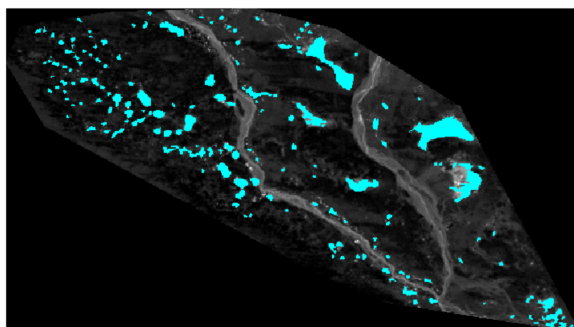


Figure S1 Thermokarst Lake Area in 2000

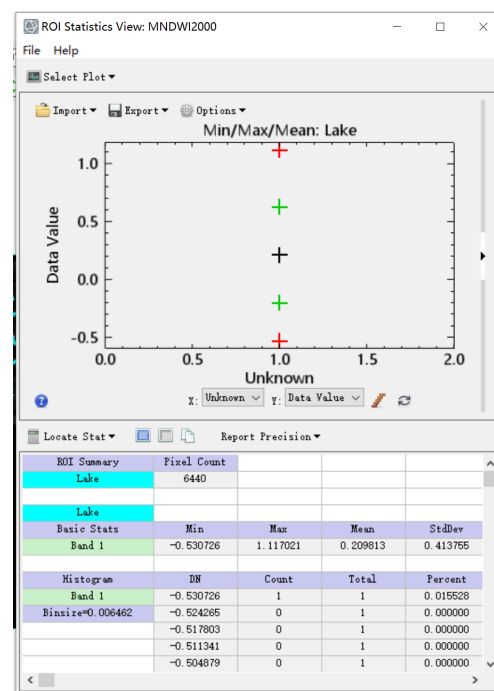


Figure S2 Histogram of Thermokarst Lake Area In 2000

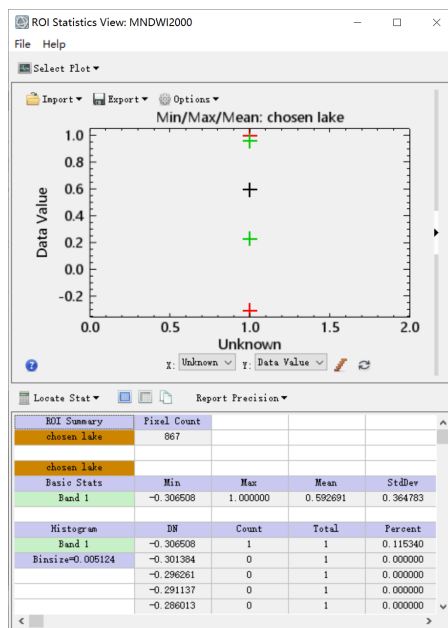


Figure S3 Histogram of Typical Thermokarst Lake In 2000

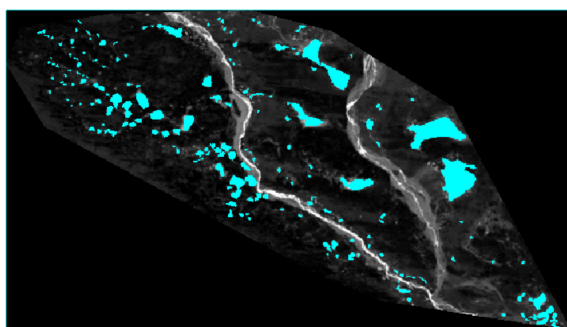


Figure S4 Thermokarst Lake Area in 2001

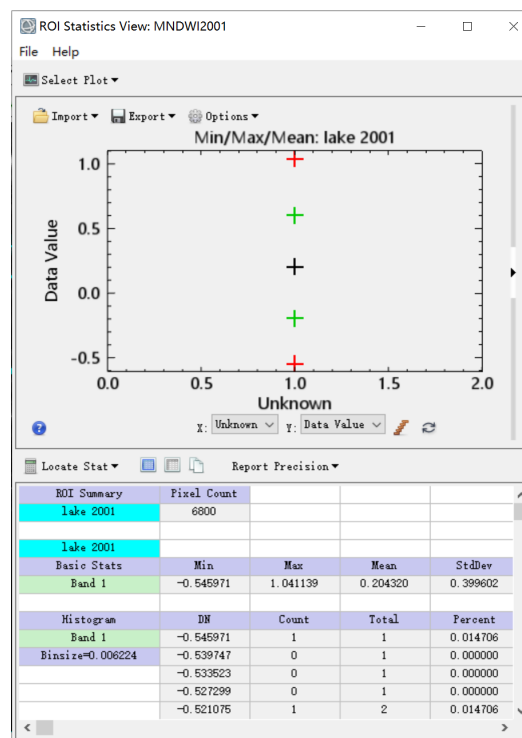


Figure S5 Histogram of Thermokarst Lake Area In 2001

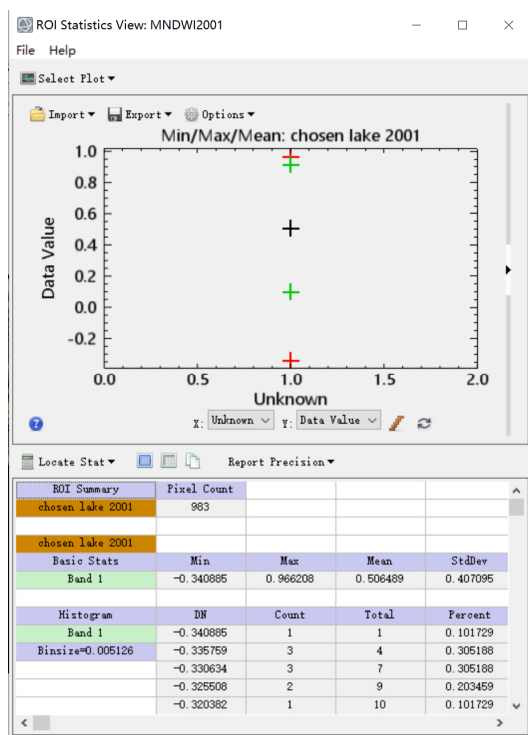


Figure S6 Histogram of Typical Thermokarst Lake In 2001

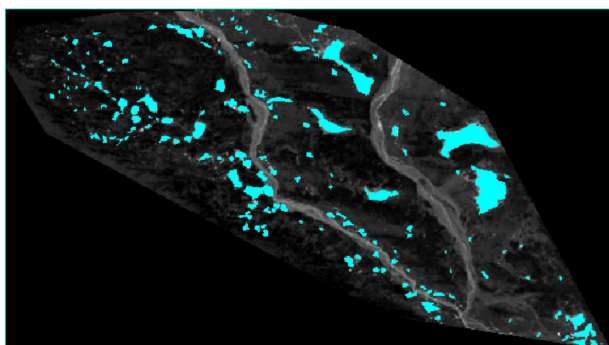


Figure S7 Thermokarst Lake Area in 2002

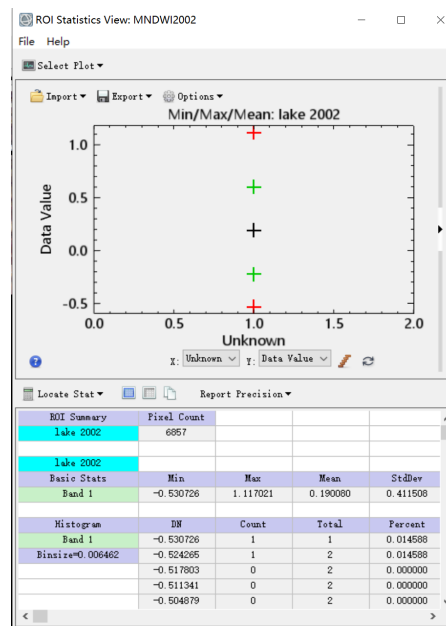


Figure S8 Histogram of Thermokarst Lake Area In 2002

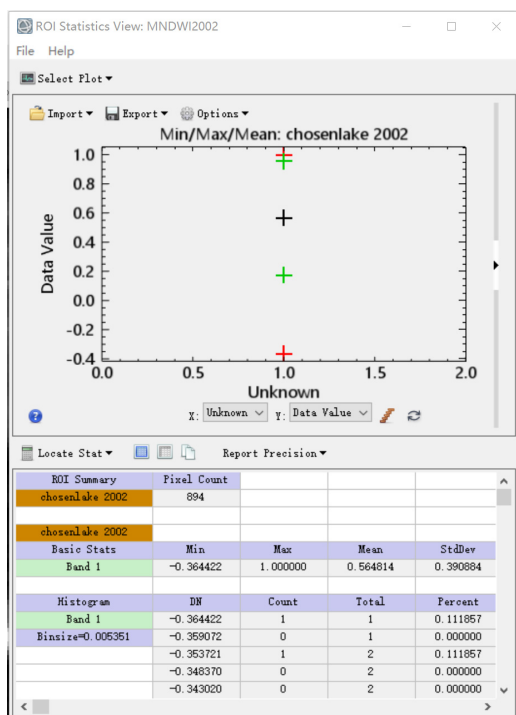


Figure S9 Histogram of Typical Thermokarst Lake In 2002

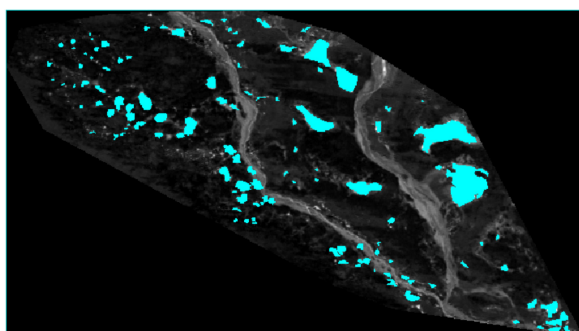


Figure S10 Thermokarst Lake Area in 2003

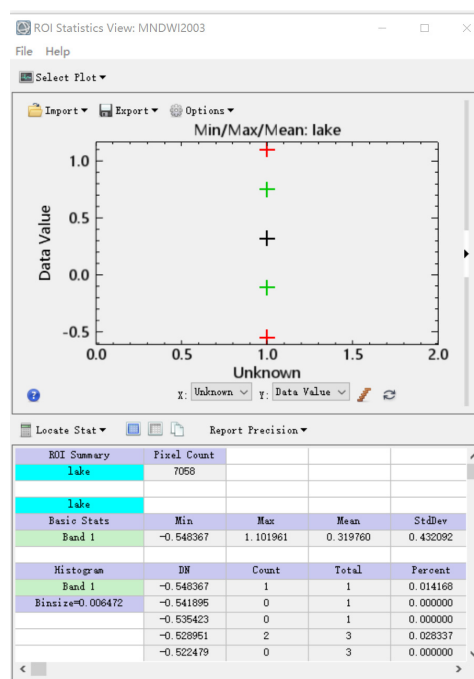


Figure S11 Histogram of Thermokarst Lake Area In 2003

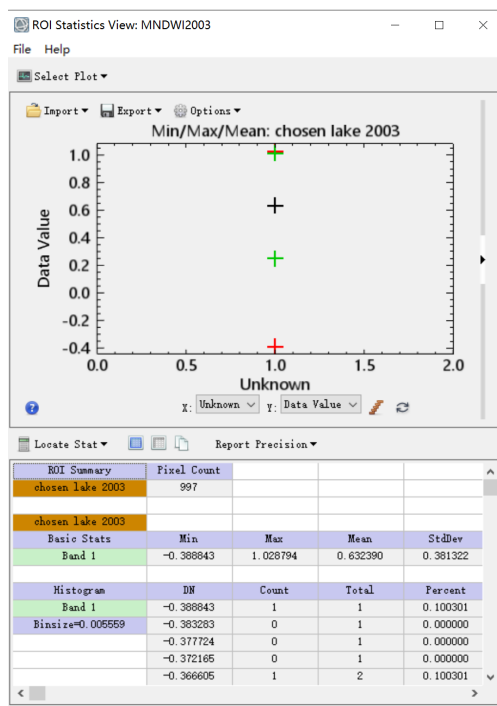


Figure S12 Histogram of Typical Thermokarst Lake In 2003

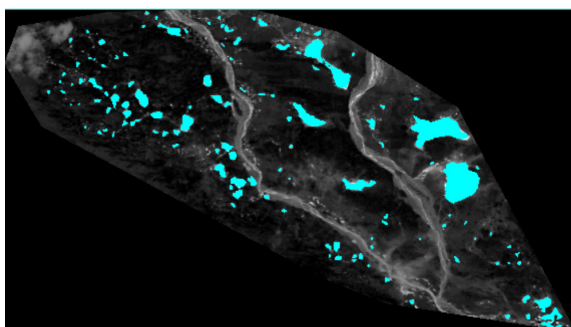


Figure S13 Thermokarst Lake Area in 2004

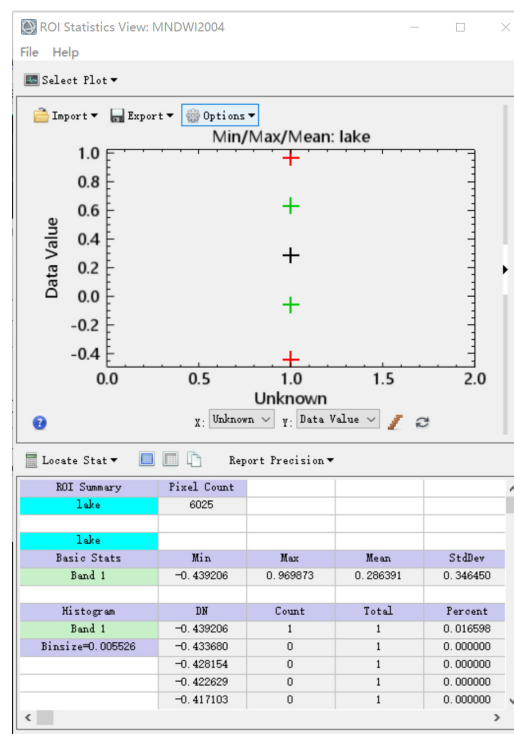


Figure S14 Histogram of Thermokarst Lake Area In 2004

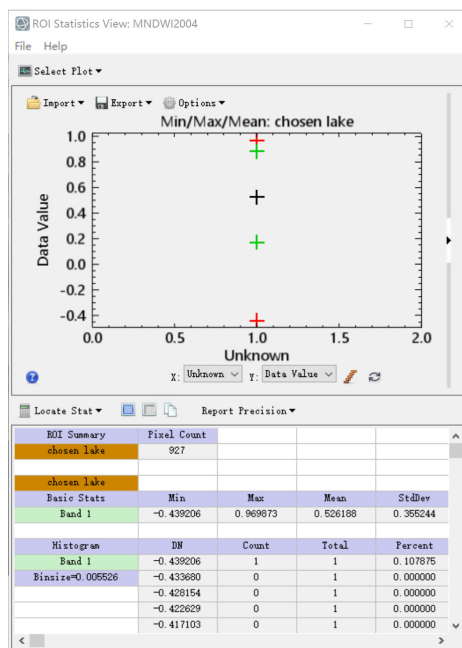


Figure S15 Histogram of Typical Thermokarst Lake In 2004

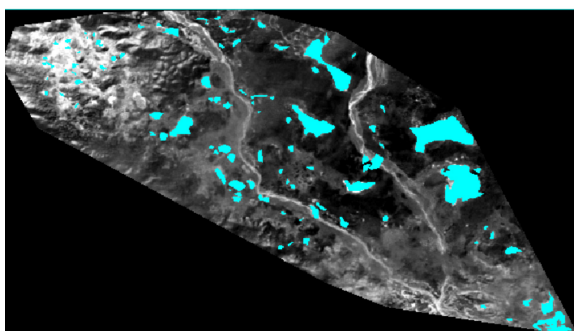


Figure S16 Thermokarst Lake Area in 2005

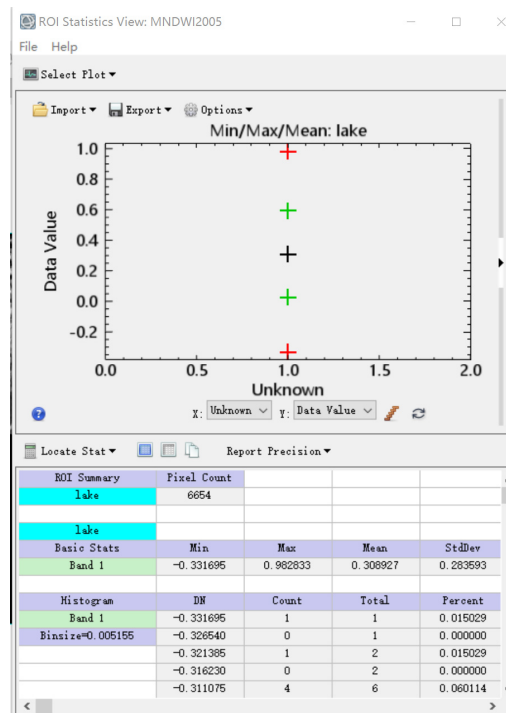


Figure S17 Histogram of Thermokarst Lake Area In 2005

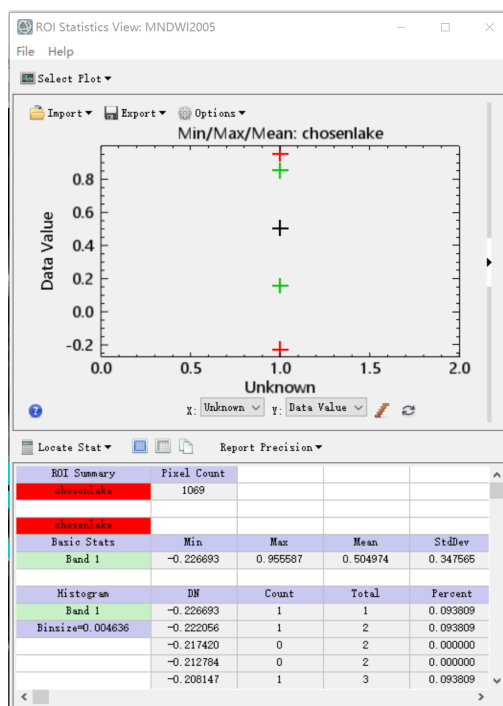


Figure S18 Histogram of Typical Thermokarst Lake In 2005

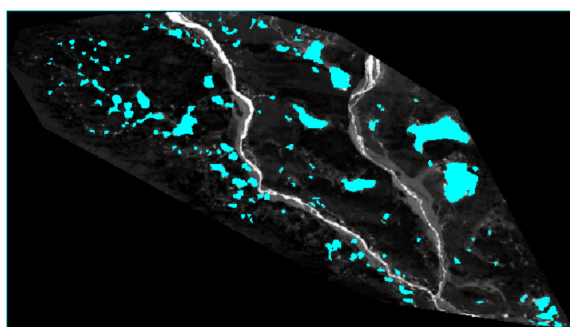


Figure S19 Thermokarst Lake Area in 2006

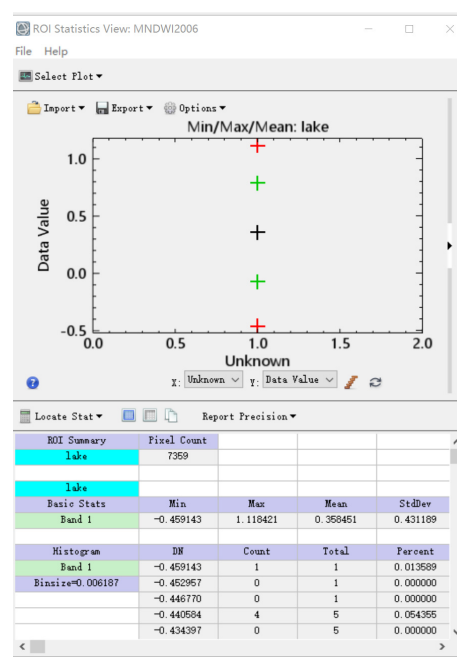


Figure S20 Histogram of Thermokarst Lake Area In 2006

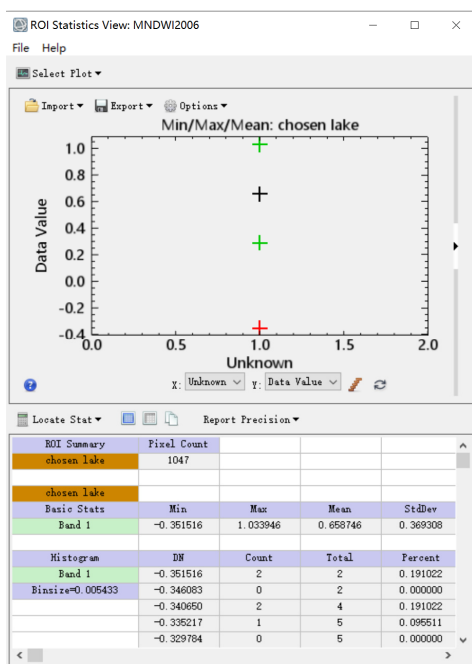


Figure S21 Histogram of Typical Thermokarst Lake In 2006

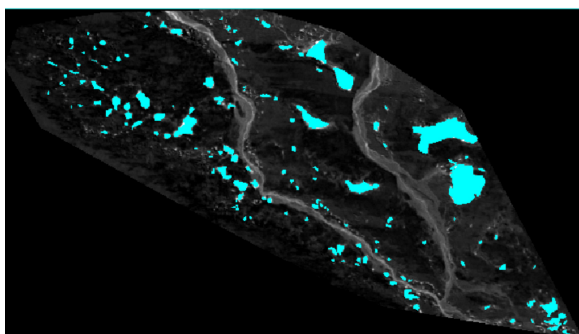


Figure S22 Thermokarst Lake Area in 2007

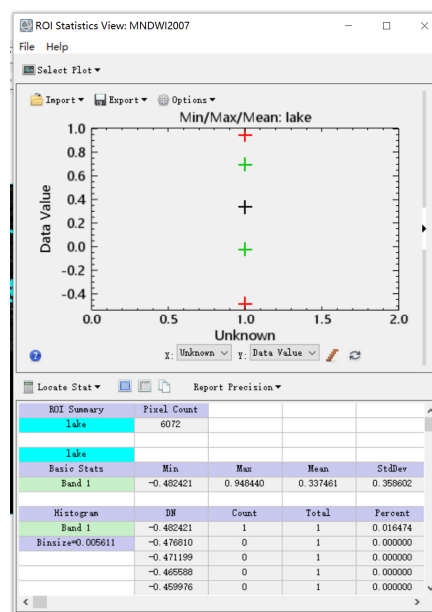


Figure S23 Histogram of Thermokarst Lake Area In 2007

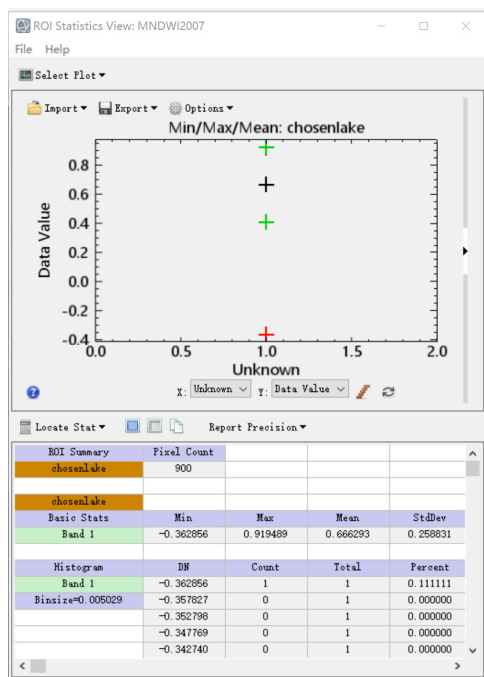


Figure S24 Histogram of Typical Thermokarst Lake In 2007

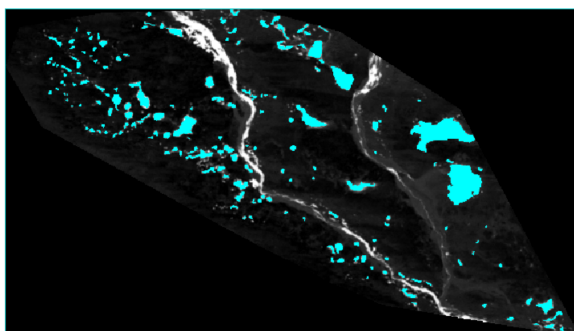


Figure S25 Thermokarst Lake Area in 2008

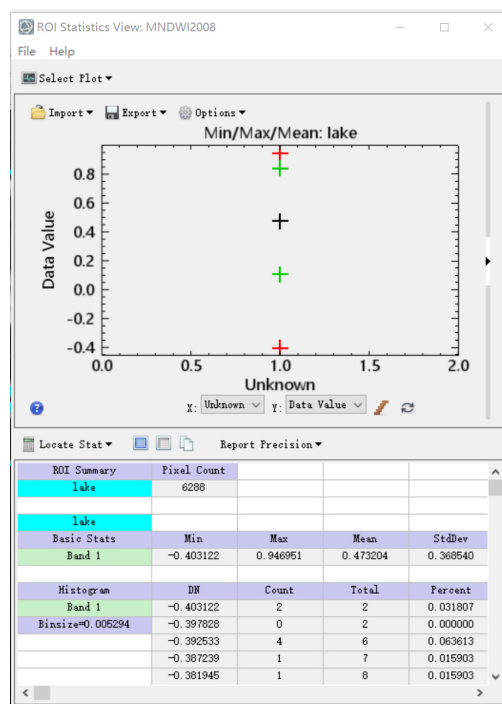


Figure S26 Histogram of Thermokarst Lake Area In 2008

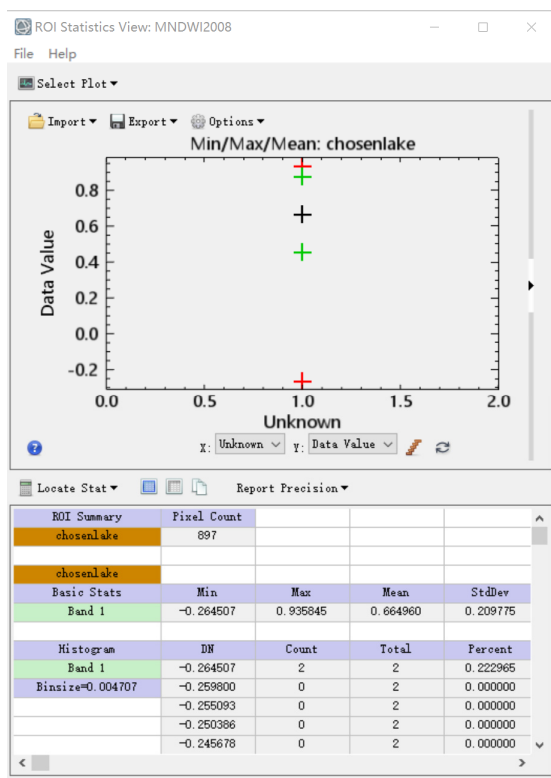


Figure S27 Histogram of Typical Thermokarst Lake In 2008

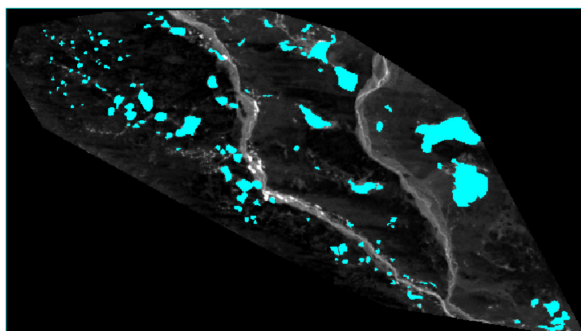


Figure S28 Thermokarst Lake Area in 2009

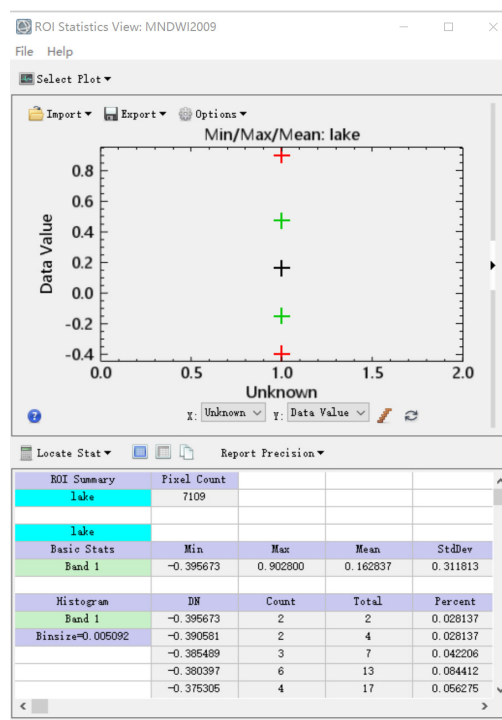


Figure S29 Histogram of Thermokarst Lake Area In 2009

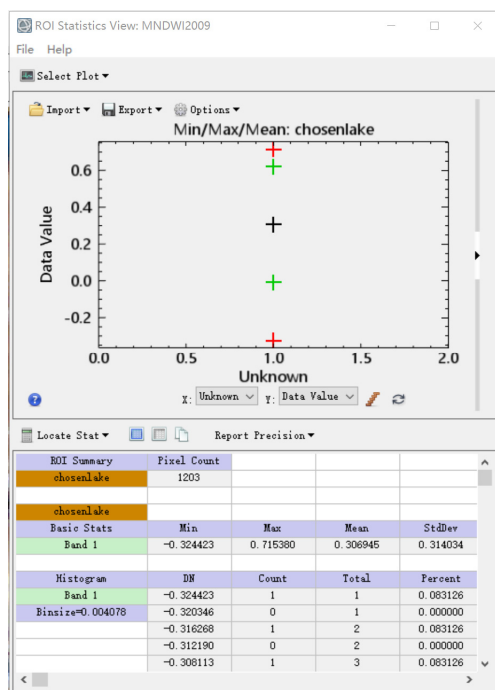


Figure S30 Histogram of Typical Thermokarst Lake In 2009

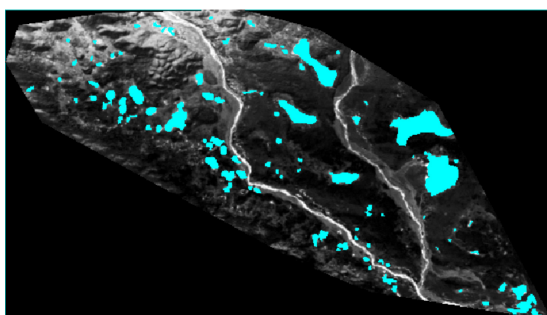


Figure S31 Thermokarst Lake Area in 2010

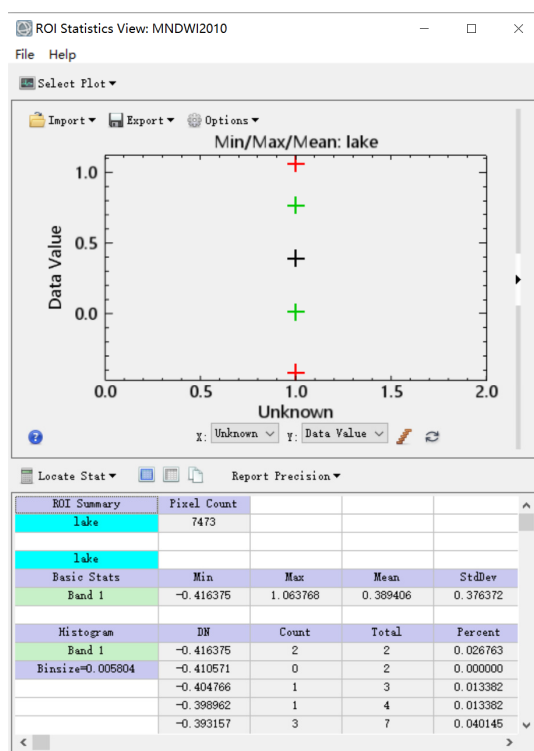


Figure S32 Histogram of Thermokarst Lake Area In 2010

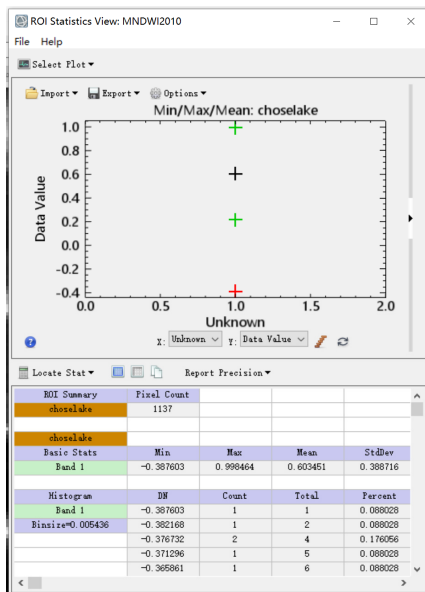


Figure S33 Histogram of Typical Thermokarst Lake In 2010

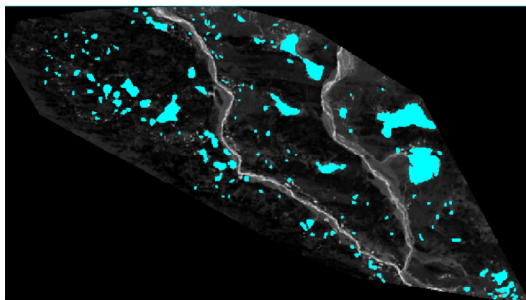


Figure S34 Thermokarst Lake Area in 2011

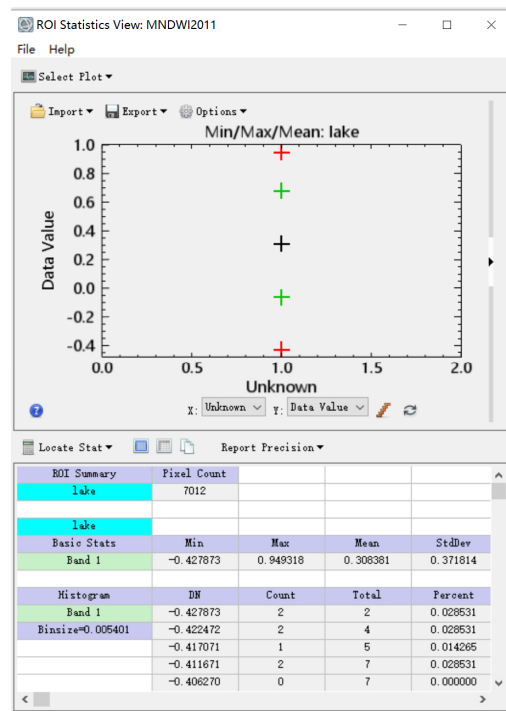


Figure S35 Histogram of Thermokarst Lake Area In 2011

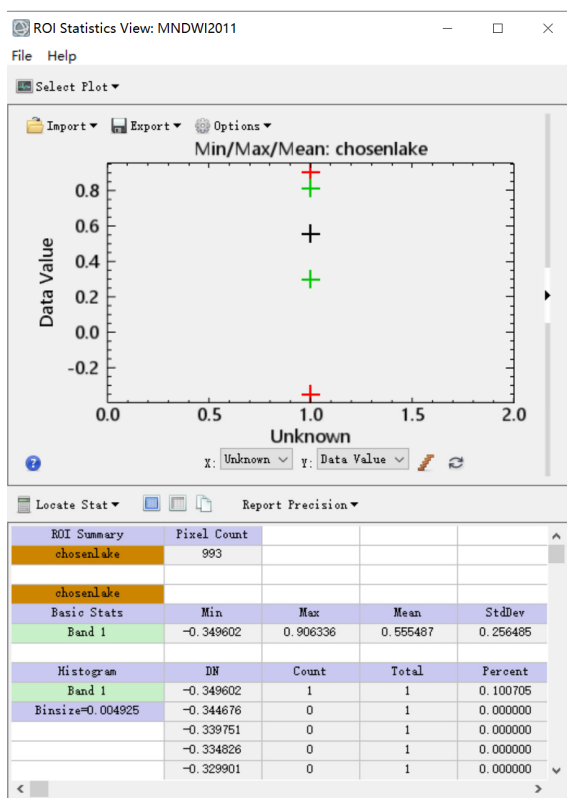


Figure S36 Histogram of Typical Thermokarst Lake In 2011

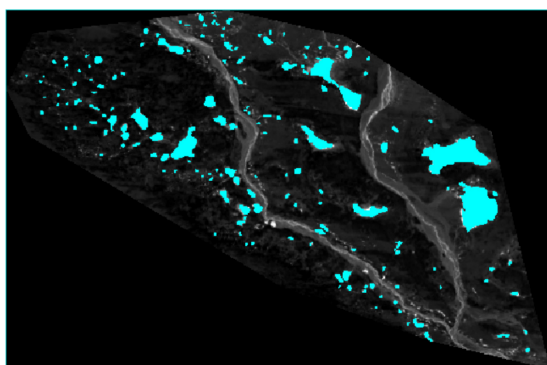


Figure S37 Thermokarst Lake Area in 2013

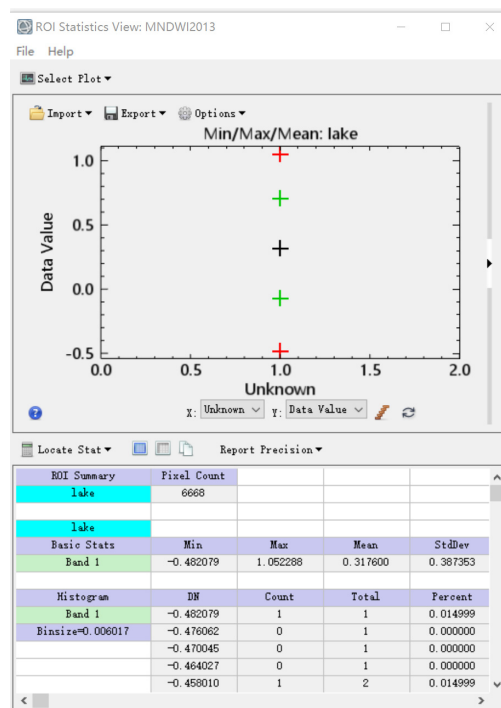


Figure S38 Histogram of Thermokarst Lake Area In 2013

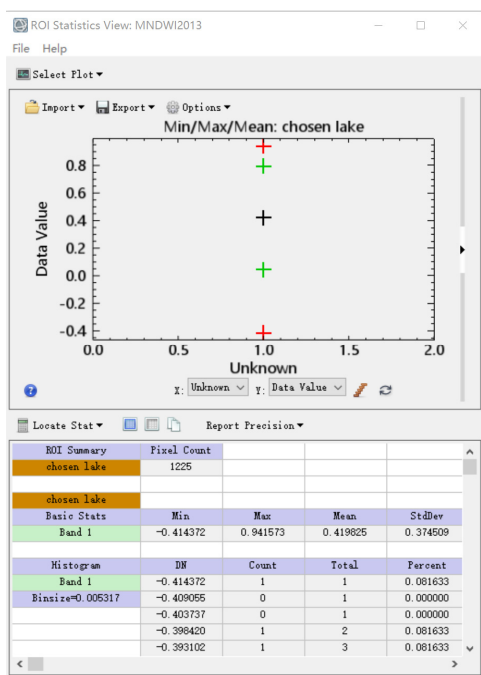


Figure S39 Histogram of Typical Thermokarst Lake In 2013

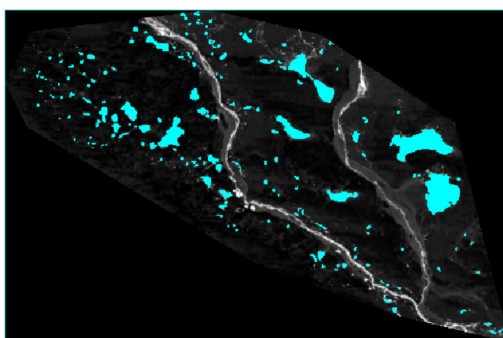


Figure S40 Thermokarst Lake Area in 2014

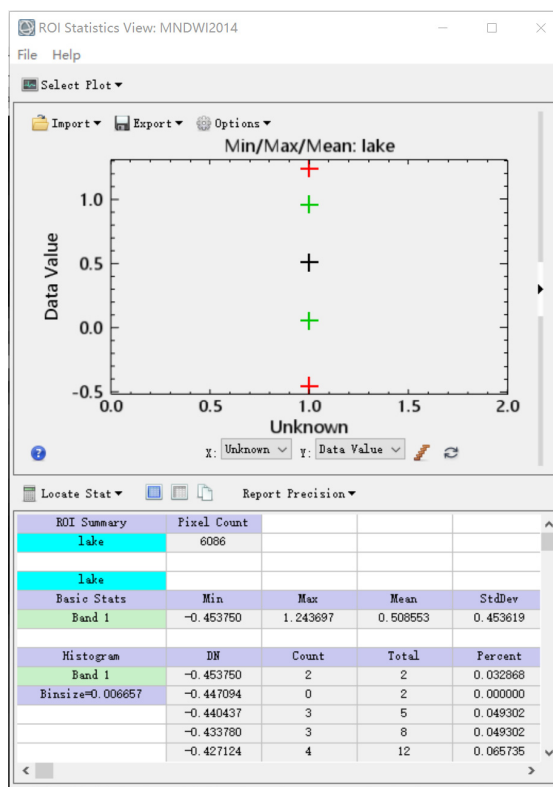


Figure S41 Histogram of Thermokarst Lake Area In 2014

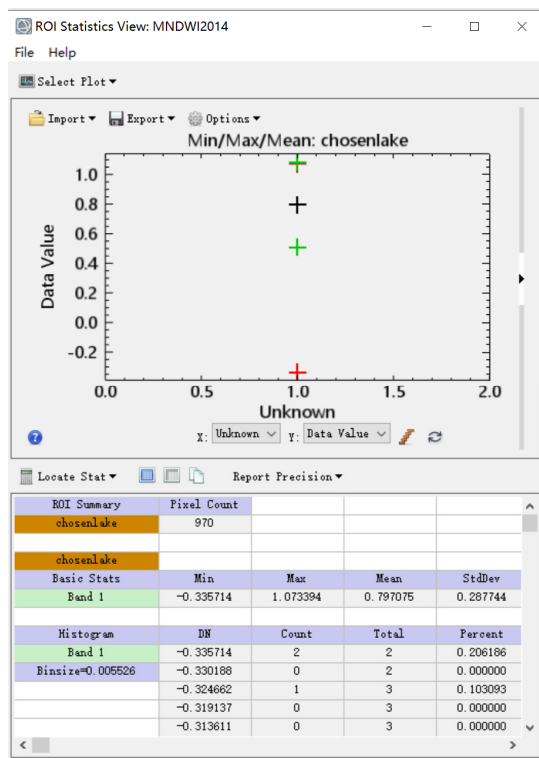


Figure S42 Histogram of Typical Thermokarst Lake In 2014

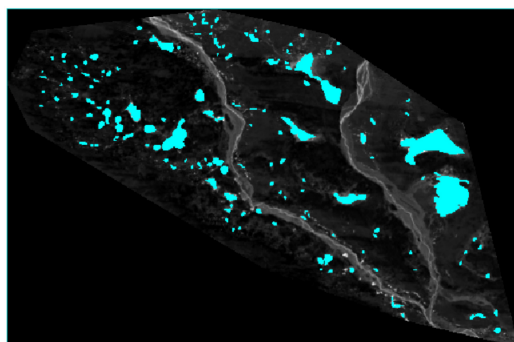


Figure S43 Thermokarst Lake Area in 2015

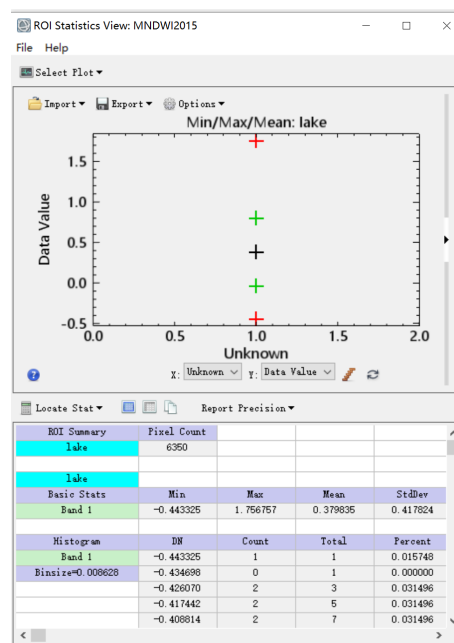


Figure S44 Histogram of Thermokarst Lake Area In 2015

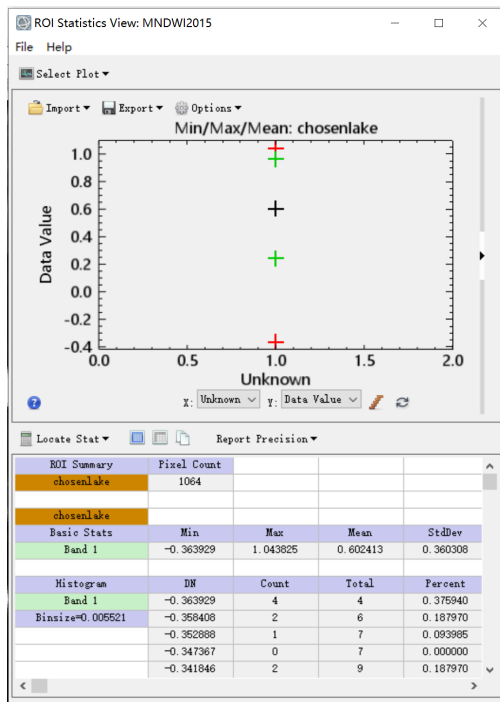


Figure S45 Histogram of Typical Thermokarst Lake In 2015

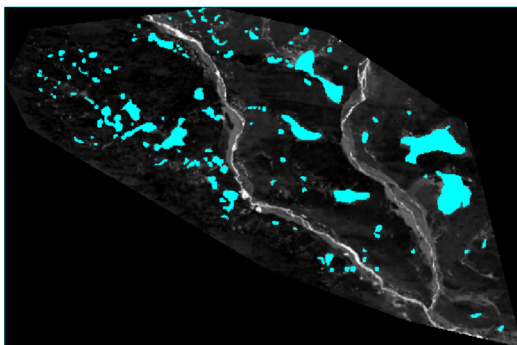


Figure S46 Thermokarst Lake Area in 2016

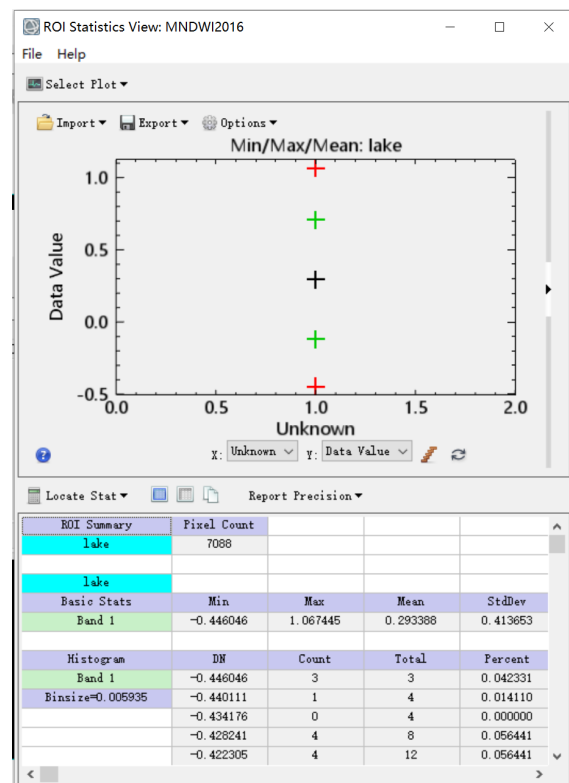


Figure S47 Histogram of Thermokarst Lake Area In 2016

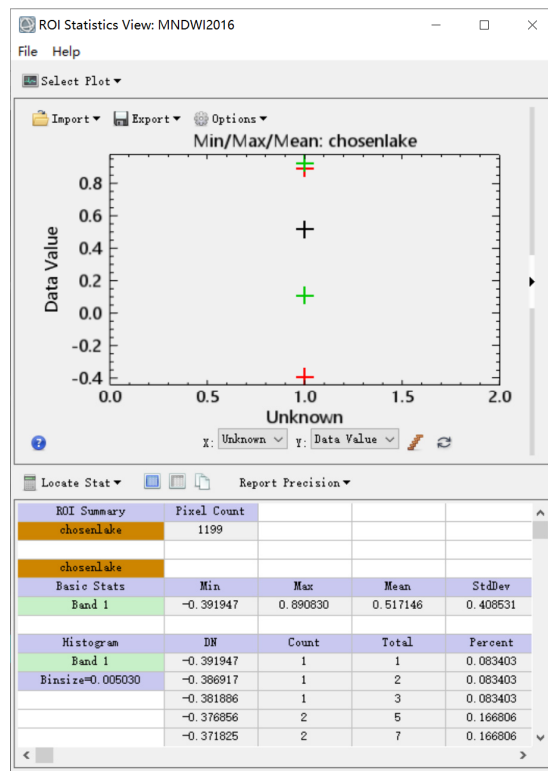


Figure S48 Histogram of Typical Thermokarst Lake In 2016

Analysis

To analyze the correlation between the thermokarst lake area changes and the weather condition, this article first chooses the Pearson correlation coefficient analysis to display the significance and correlation between each variable. In statistics, the Pearson correlation coefficient formula is:

$$r = \frac{\sum_{i=1}^n (X_i - \bar{X})(Y_i - \bar{Y})}{\sqrt{\sum_{i=1}^n (X_i - \bar{X})^2} \sqrt{\sum_{i=1}^n (Y_i - \bar{Y})^2}}$$

where r is the Pearson correlation coefficient, X , Y are two independent variables, n is the number of elements in X variable. The coefficient has a value between +1 and -1. A value of +1 is a total positive linear correlation, 0 is no linear correlation, and -1 is the absolute negative linear correlation. If the coefficient value is more close to 1 or -1, the correlation is significant. Otherwise, if the coefficient value is 0, there is no correlation between the two variables. Using SPSS statistics software, the correlation between the thermokarst lake area changes and the weather conditions is shown below.