

## Wind Roses

**Detailed Description:** Wind rose charts depict the percent frequency of occurrence (percent occurrence) of different wind direction and wind speed combinations for a specific location. The data is displayed on a 2-D graph using 16 compass directions. Wind speed is broken out into 10 categories, plus calm: 1-6 knots, 7-10 knots, 11-16 knots, 17-21 knots, 22-27 knots, 28-33 knots, 34-40 knots, 41-47 knots, 48-55 knots, and greater than 55 knots. Each wind speed category is color-coded on the graph. The percent occurrence is indicated by tick marks along each radial. A tick mark legend is shown along the north (N) radial.

To determine the percent occurrence for a particular wind direction, locate the tick mark bounding the outer edge of the desired wind speed category. For example, the outer edge of a 22-27 knot category falls on the 10-tick mark on the N radial. The user should interpret that as 10% of the time, the winds were from the north and were 27 knots or less.

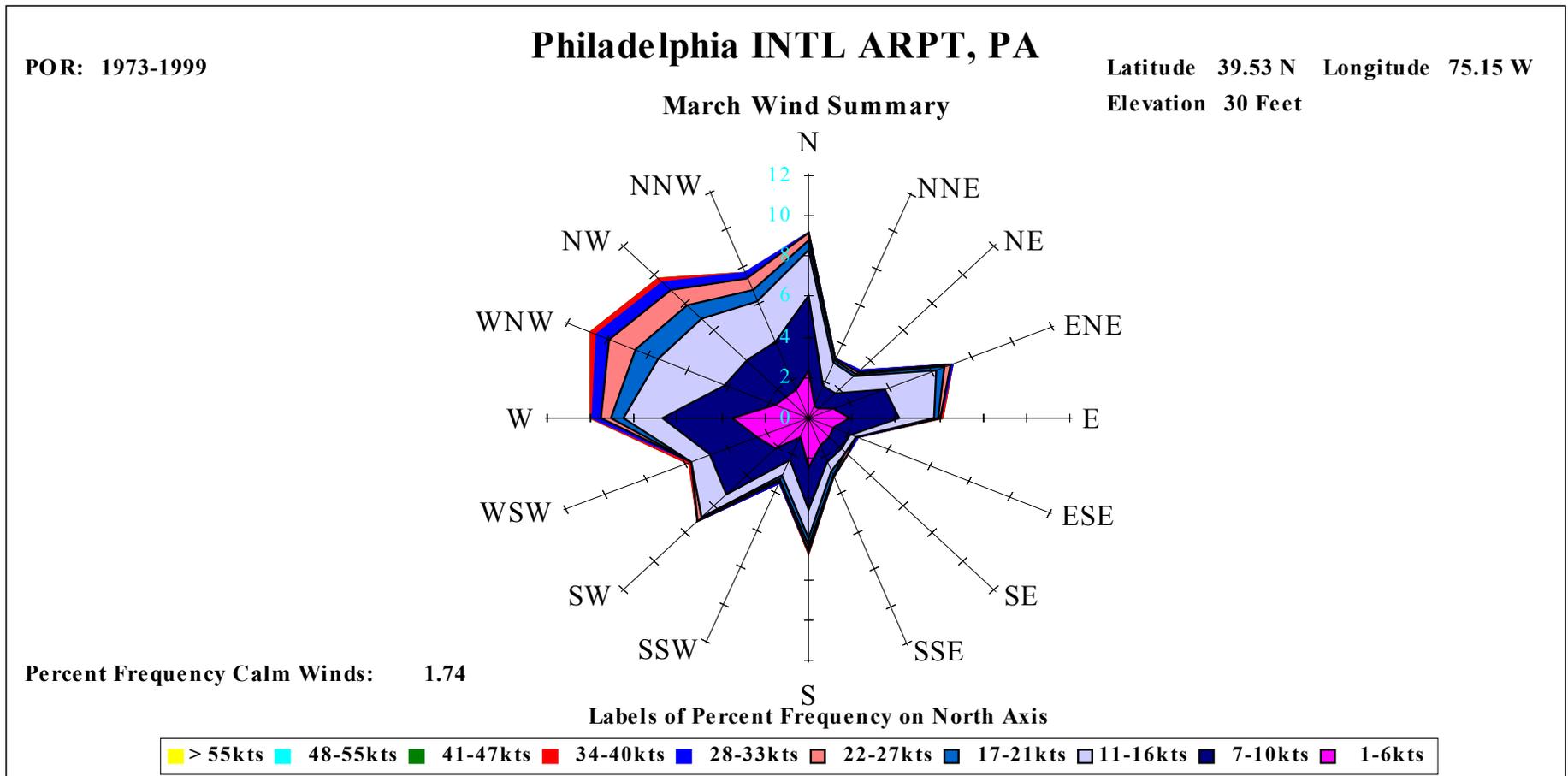
To come up with the percent occurrence (again, from the north) for just the 22-27 knot category, first determine what the percent occurrence is for the 17-21 knot category. For example, say the value is 7. Subtract the 17-21 knot value, 7, from the 22-27 knot value, 10, to get 3. So 3% of the time, the winds were from the north at 22-27 knots. As the user goes further out along the wind direction radial, the percent occurrence will usually get smaller for each speed category.

The user should note that the values for percent frequency have been summed by direction, so to determine the total percent frequency for all speeds from a particular direction, locate the tick mark bounding the outermost colored area along the desired wind direction radial. That tick mark value will represent the total percent of time that the wind occurred from the direction picked. For example, if the outermost wind speed boundary from the northwest (NW) falls between the 10 and 12 tick mark, the user would interpret that as 11% of the time, the wind blows from the NW.

Wind rose charts can be prepared by month, quarter or year.

Other information included on a wind rose chart: the site's name; the site's latitude and longitude; the station elevation in meters or feet; and the period of record (POR) used in making the chart. Normally, the POR goes from 1973 to most current complete year of data AFCCC has.

**Sample Wind Rose chart depicting March data for Philadelphia**



From the above example, the percent occurrence of wind between 1-6 knots from the northwest is just over 1%. Staying on the northwest radial, the percent occurrence of wind between 7-10 knots is 3% (4 minus 1). The rest of the percentages break out as follows:

- for 11-16 knots, the % occurrence is 3% (7 minus 4).
- for 17-21 knots, it's 1% (8 minus 7).
- for 22-27 knots, it's 1% (9 minus 8).
- for 28-33 knots, it's just over 0.5% (9.5 minus 9).
- for 34-40 knots, it's under 0.5 %.

The percent of the time the wind is calm is shown in the lower left-hand corner of the chart: 1.74 %.

When the outermost value from each of the 16 directions are added together along with the calm wind value, the result is 100% (allowing for rounding). NOTE: Occurrences of variable winds are omitted from the data before computing the wind rose.

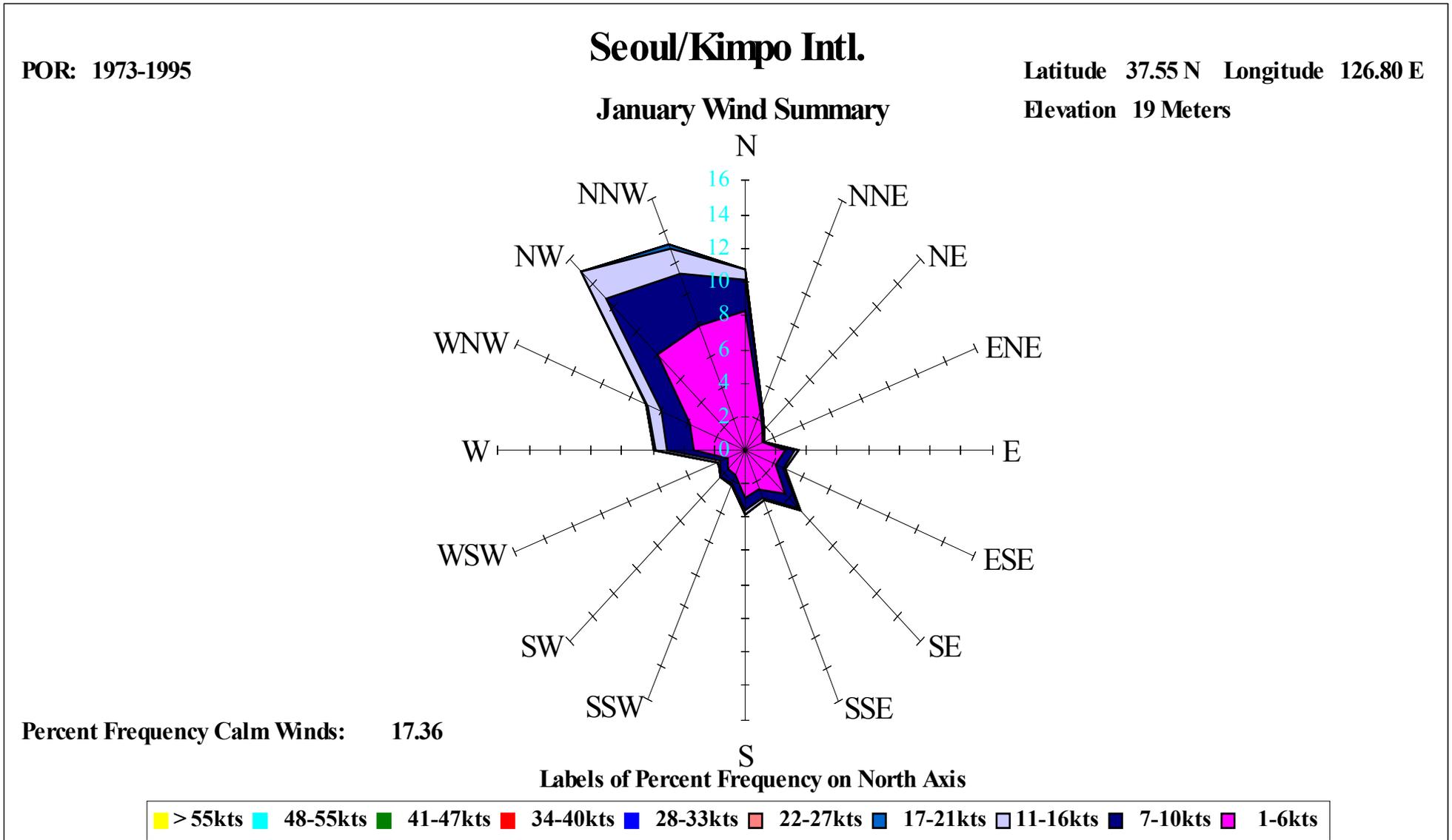
**Potential Uses:** Knowing the probable wind speed and direction in a particular time of the year can be helpful in construction, mission planning, as well as in designing structures, which must face severe wind-driven rain or drifting snow. Engineers designing heating and air conditioning systems that draw fresh air in and blow contaminated building air out can use wind roses to minimize the potential for cross-contamination between the two air streams. When there is a chance drifting snow will accumulate on a roof, wind rose information can be used to determine where to put inlet and exhaust ducts so they are less likely to be covered up. Wind direction and speed can also be used to determine how local weather can impact operations on and around an airfield.

**Known Limitations:** The wind currents around any building are strongly affected by the geometry of the building itself, any nearby buildings and the surrounding topography. Note that the wind data used to make these charts was normally taken in flat and open airfields, where there are few obstructions near the observation point.

Limited or missing weather observations from a location may skew the data used in a wind rose. Questionable wind roses may result from limited duty stations or sites where unreliable observing techniques are used. The larger the amount of weather observations used to make the wind rose, the better the wind rose's accuracy and reliability.

## Wind Rose Package

The following example contains a sample wind rose data set for Seoul/Kimpo International Airport, South Korea and includes a wind rose for each month and an annual wind rose summarizing the wind for the entire year.



**Percent Frequency Calm Winds: 17.36**

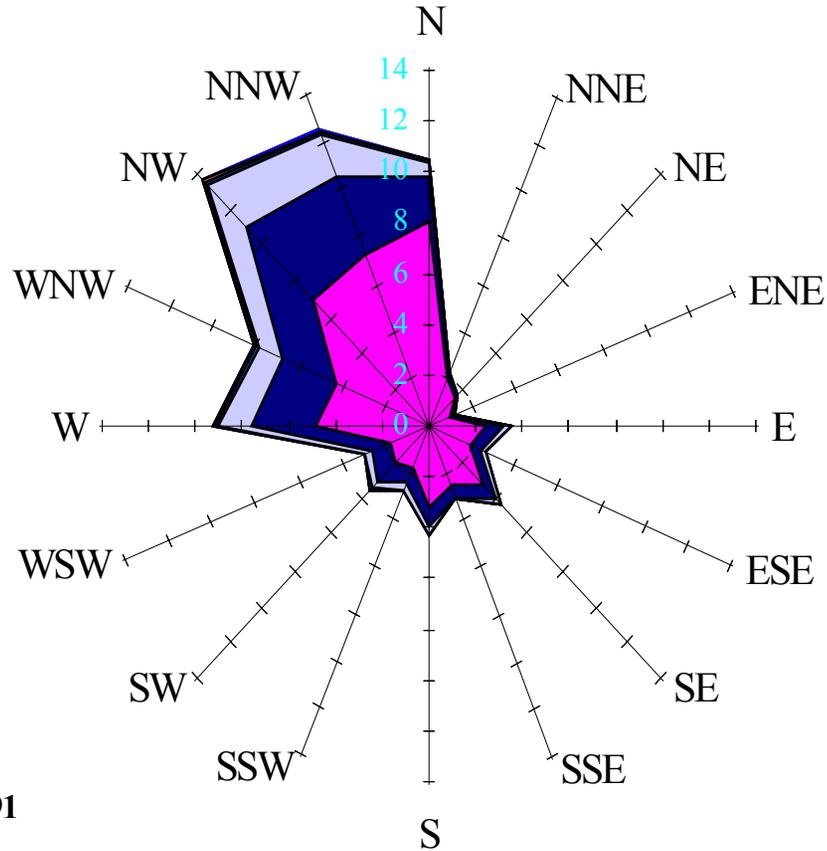
POR: 1973-1995

# Seoul/Kimpo Intl.

Latitude 37.55 N Longitude 126.80 E

## February Wind Summary

Elevation 19 Meters



Percent Frequency Calm Winds: 13.91

Labels of Percent Frequency on North Axis



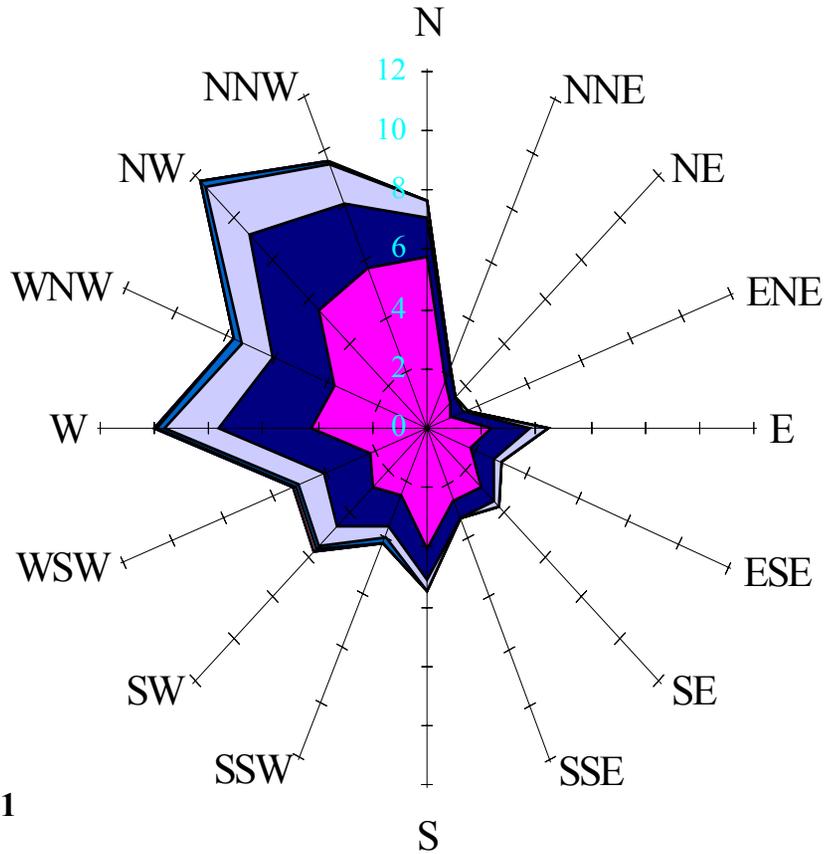
POR: 1973-1995

# Seoul/Kimpo Intl.

Latitude 37.55 N Longitude 126.80 E

## March Wind Summary

Elevation 19 Meters



Percent Frequency Calm Winds: 13.11

Labels of Percent Frequency on North Axis



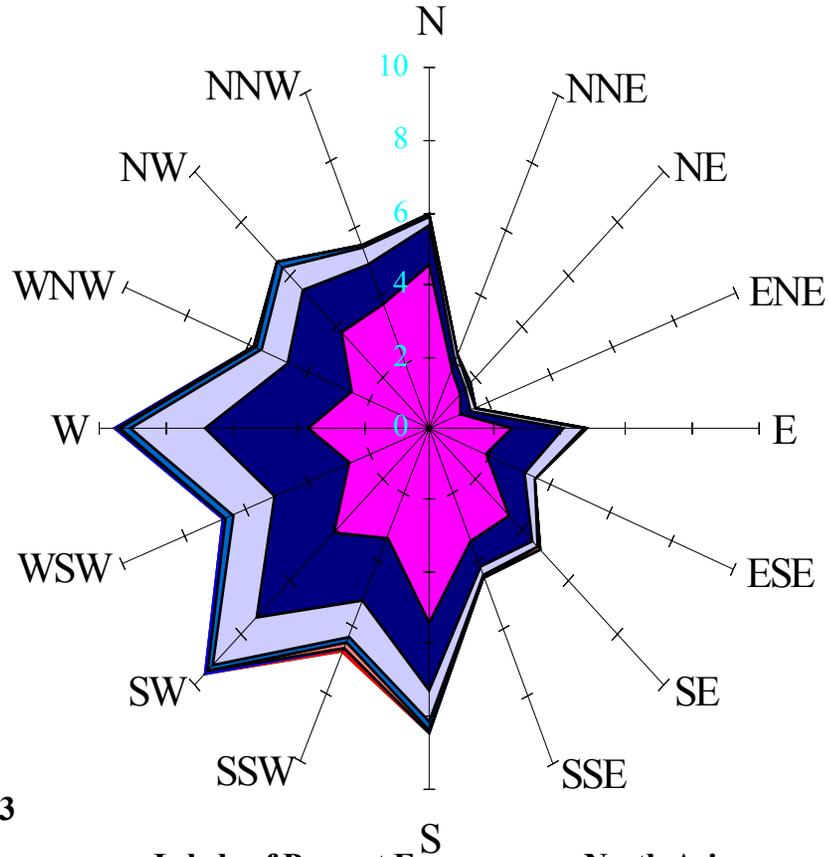
POR: 1973-1995

# Seoul/Kimpo Intl.

Latitude 37.55 N Longitude 126.80 E

## April Wind Summary

Elevation 19 Meters



Percent Frequency Calm Winds: 12.23

> 55kts 48-55kts 41-47kts 34-40kts 28-33kts 22-27kts 17-21kts 11-16kts 7-10kts 1-6kts

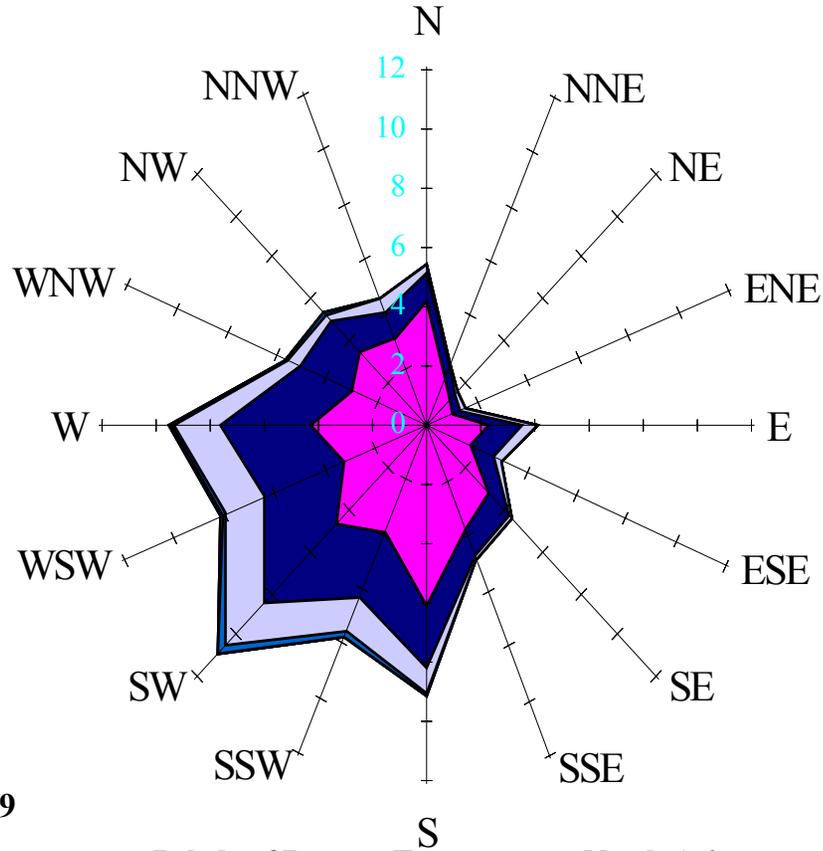
POR: 1973-1995

# Seoul/Kimpo Intl.

Latitude 37.55 N Longitude 126.80 E

## May Wind Summary

Elevation 19 Meters



Percent Frequency Calm Winds: 11.89

> 55kts 48-55kts 41-47kts 34-40kts 28-33kts 22-27kts 17-21kts 11-16kts 7-10kts 1-6kts

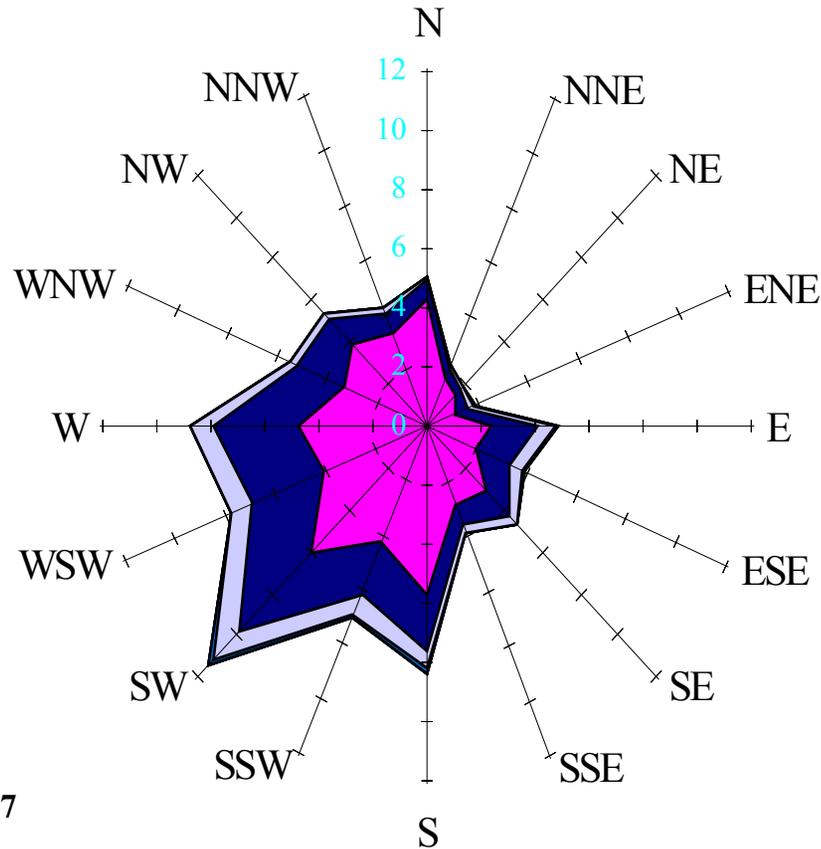
POR: 1973-1995

# Seoul/Kimpo Intl.

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## June Wind Summary

Elevation 19 Meters



Percent Frequency Calm Winds: 13.17

Labels of Percent Frequency on North Axis



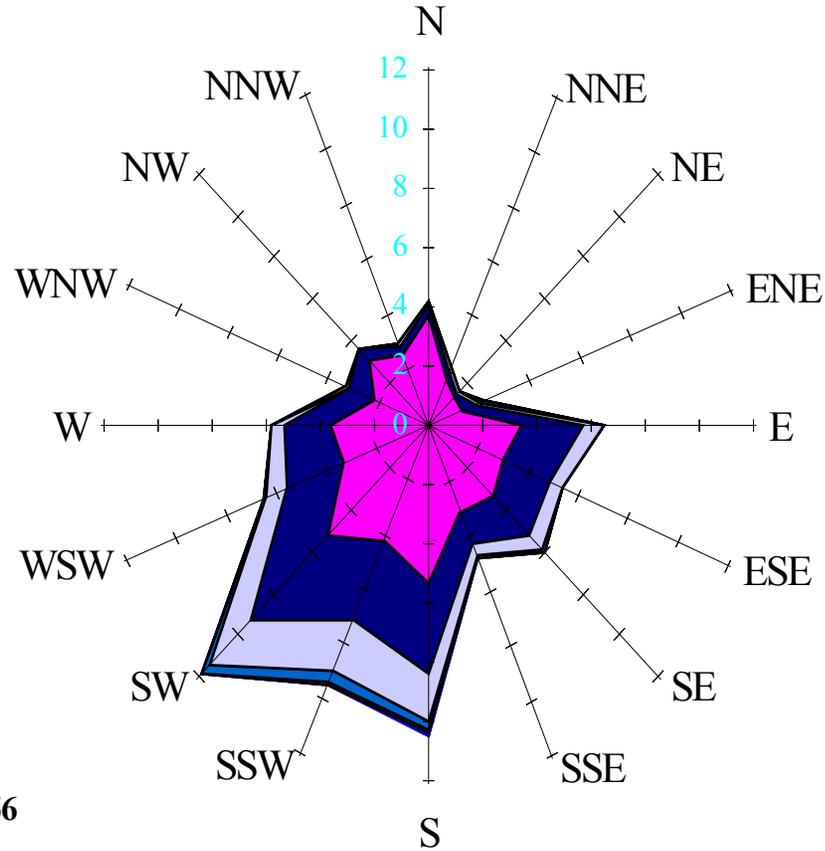
POR: 1973-1995

# Seoul/Kimpo Intl.

Latitude 37.55 N Longitude 126.80 E

## July Wind Summary

Elevation 19 Meters



Percent Frequency Calm Winds: 13.56

Labels of Percent Frequency on North Axis



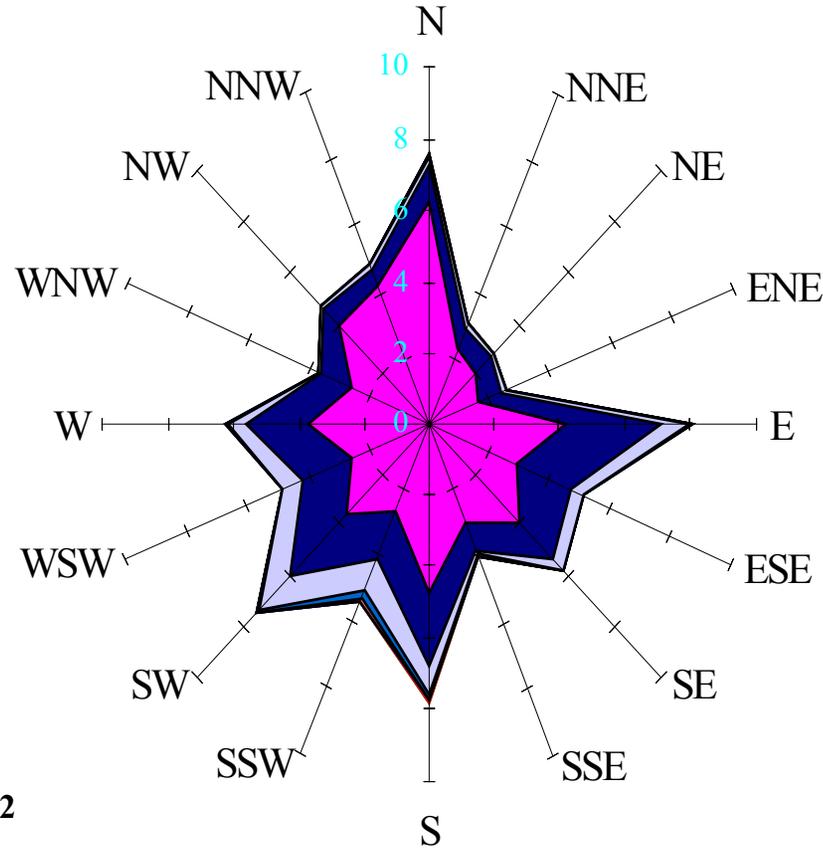
POR: 1973-1995

# Seoul/Kimpo Intl.

Latitude 37.55 N Longitude 126.80 E

## August Wind Summary

Elevation 19 Meters



Percent Frequency Calm Winds: 15.82

Labels of Percent Frequency on North Axis



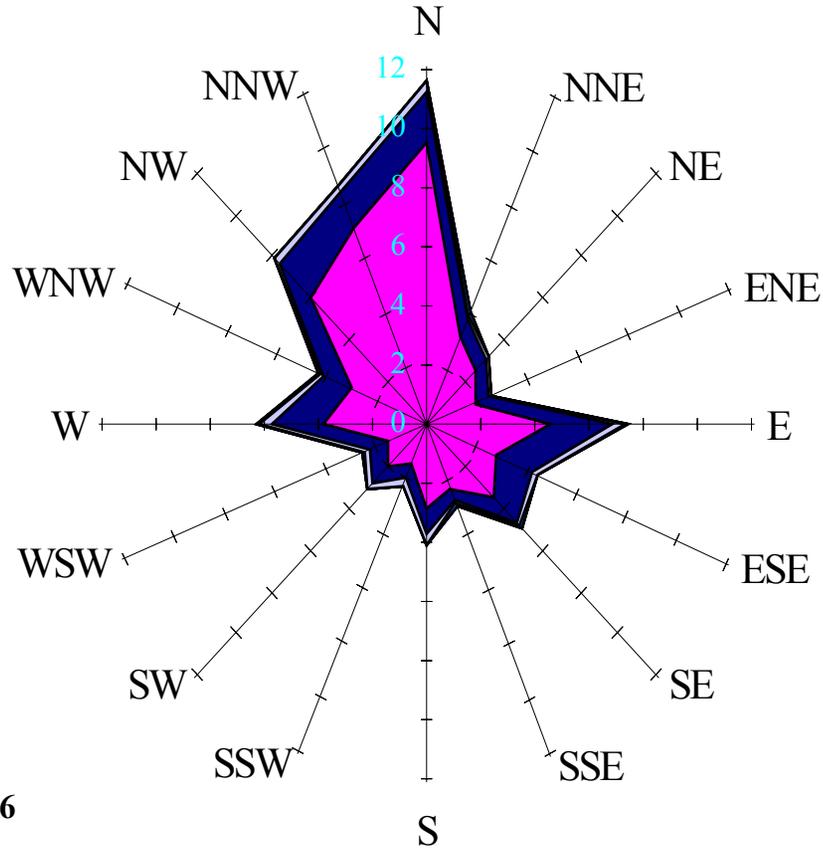
POR: 1973-1995

# Seoul/Kimpo Intl.

Latitude 37.55 N Longitude 126.80 E

## September Wind Summary

Elevation 19 Meters



Percent Frequency Calm Winds: 19.36

Labels of Percent Frequency on North Axis



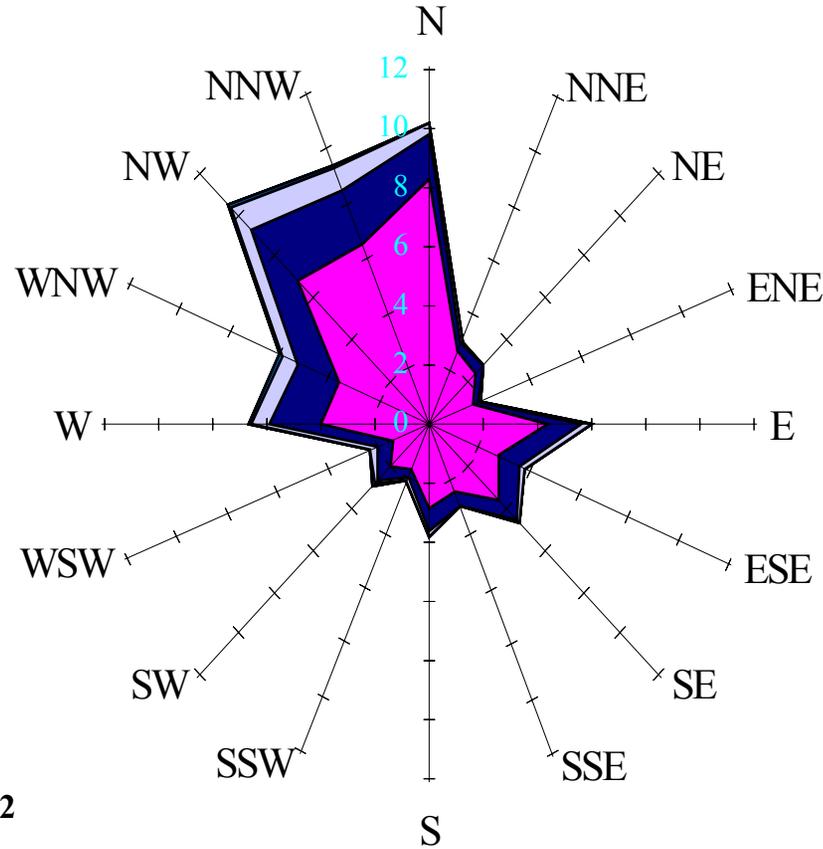
POR: 1973-1995

# Seoul/Kimpo Intl.

Latitude 37.55 N Longitude 126.80 E

## October Wind Summary

Elevation 19 Meters



Percent Frequency Calm Winds: 20.62

> 55kts 48-55kts 41-47kts 34-40kts 28-33kts 22-27kts 17-21kts 11-16kts 7-10kts 1-6kts

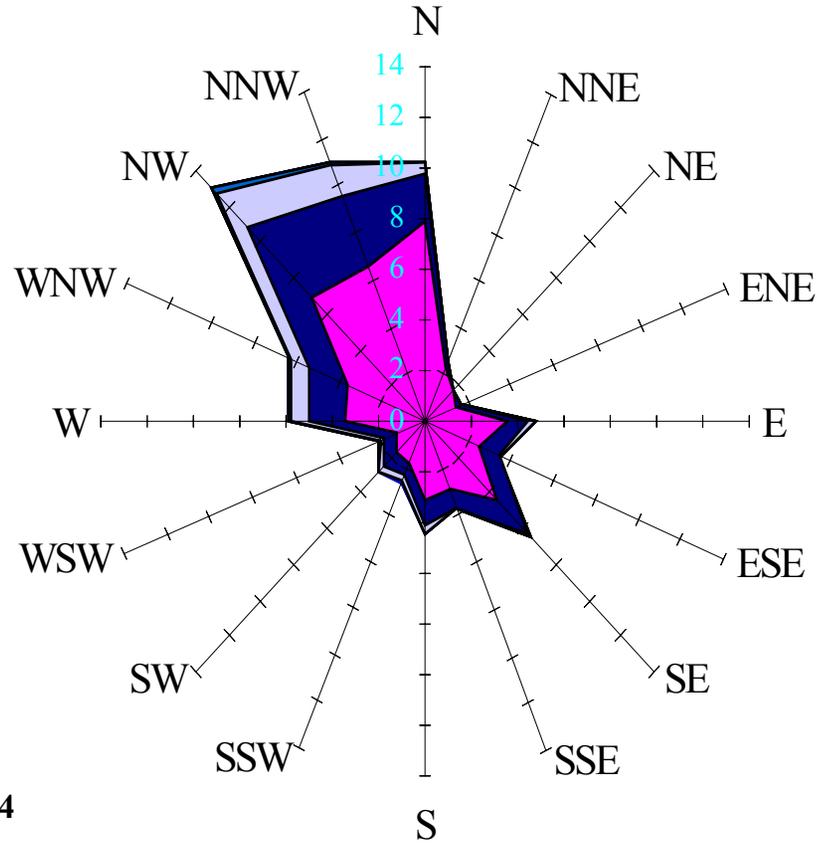
POR: 1973-1995

# Seoul/Kimpo Intl.

Latitude 37.55 N Longitude 126.80 E

## November Wind Summary

Elevation 19 Meters



Percent Frequency Calm Winds: 16.54

Labels of Percent Frequency on North Axis



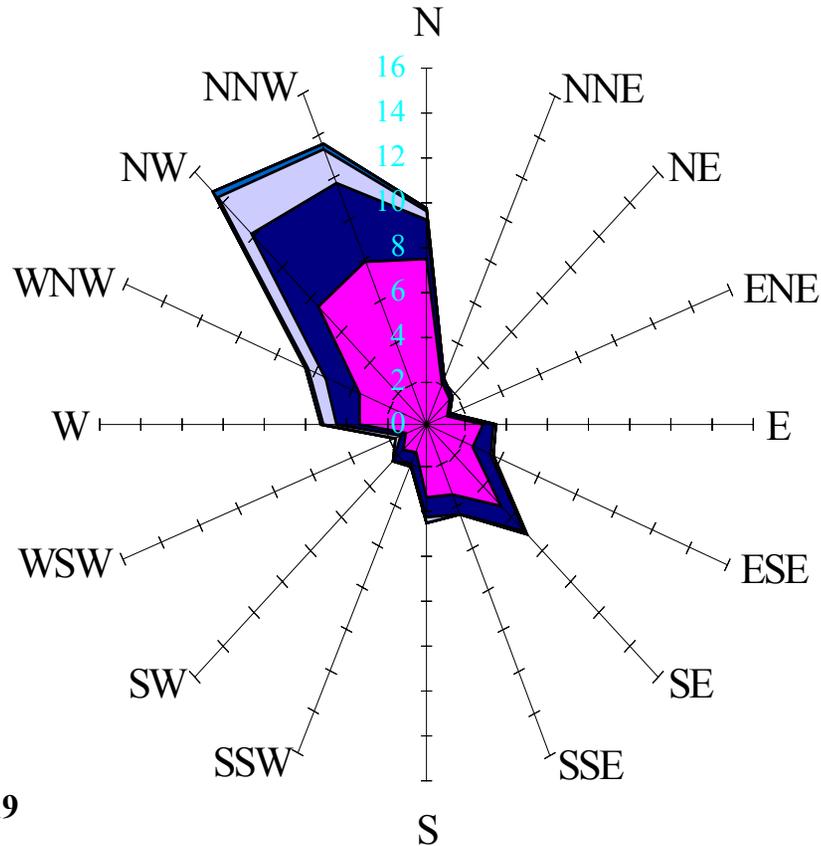
POR: 1973-1995

# Seoul/Kimpo Intl.

Latitude 37.55 N Longitude 126.80 E

## December Wind Summary

Elevation 19 Meters



Percent Frequency Calm Winds: 16.19

Labels of Percent Frequency on North Axis



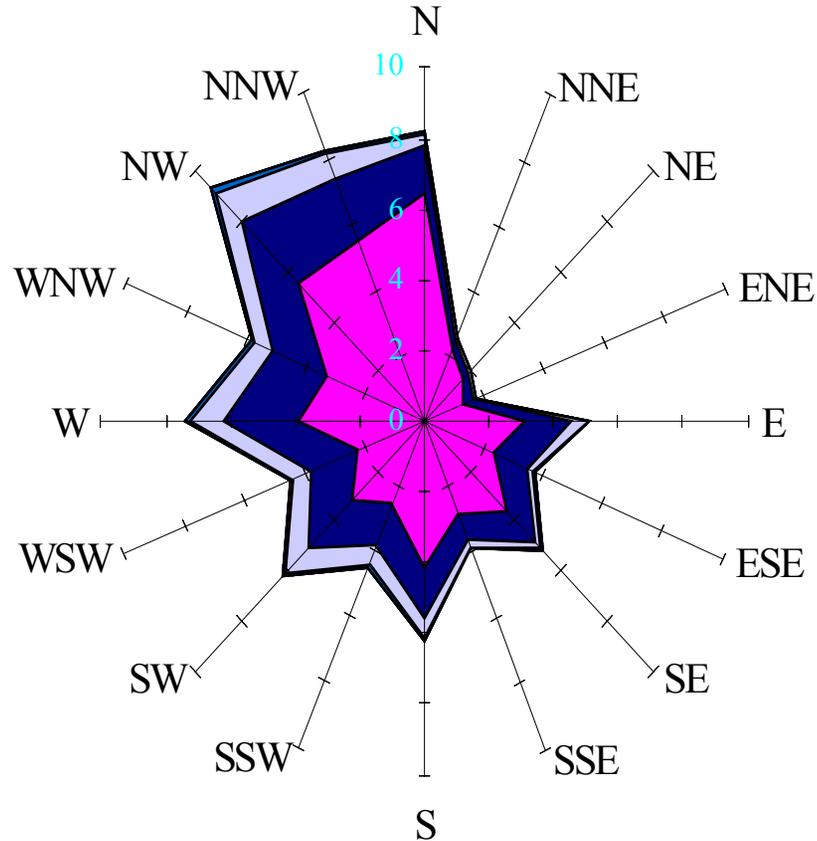
POR: 1973-1995

# Seoul/Kimpo Intl.

Latitude 37.55 N Longitude 126.80 E

## Annual Wind Summary

Elevation 19 Meters



Percent Frequency Calm Winds: 15.3

Labels of Percent Frequency on North Axis

