Water Quality : Lakes of Schirmacher Oasis, Antarctica

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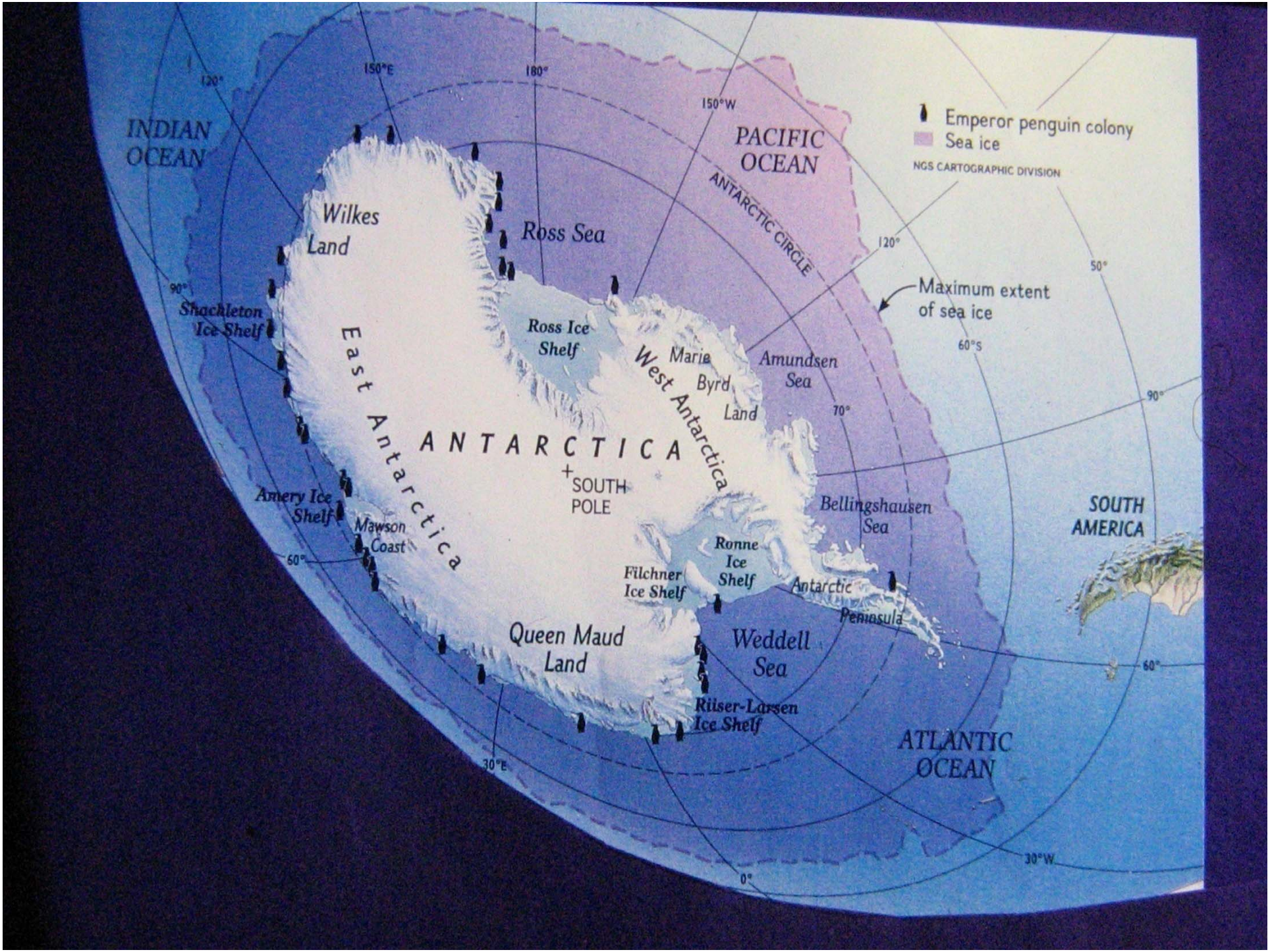

Emperor penguin colony
Sea ice
NGS CARTOGRAPHIC DIVISION
INDIAN OCEAN
PACIFIC OCEAN
ATLANTIC OCEAN
SOUTH AMERICA
ANTARCTIC CIRCLE
Maximum extent of sea ice
ANTARCTICA
SOUTH POLE
Wilkes Land
Ross Sea
Ross Ice Shelf
Shackleton Ice Shelf
East Antarctica
West Antarctica
Marie Byrd Land
Amundsen Sea
Bellingshausen Sea
Amery Ice Shelf
Mawson Coast
Filchner Ice Shelf
Ronne Ice Shelf
Antarctic Peninsula
Queen Maud Land
Weddell Sea
Riiser-Larsen Ice Shelf
120°
150°E
180°
150°W
120°
90°
50°
60°S
70°
90°
60°
60°
30°E
0°
30°W

Schirmacher Oasis, Antarctica

Maitree and Tirumala

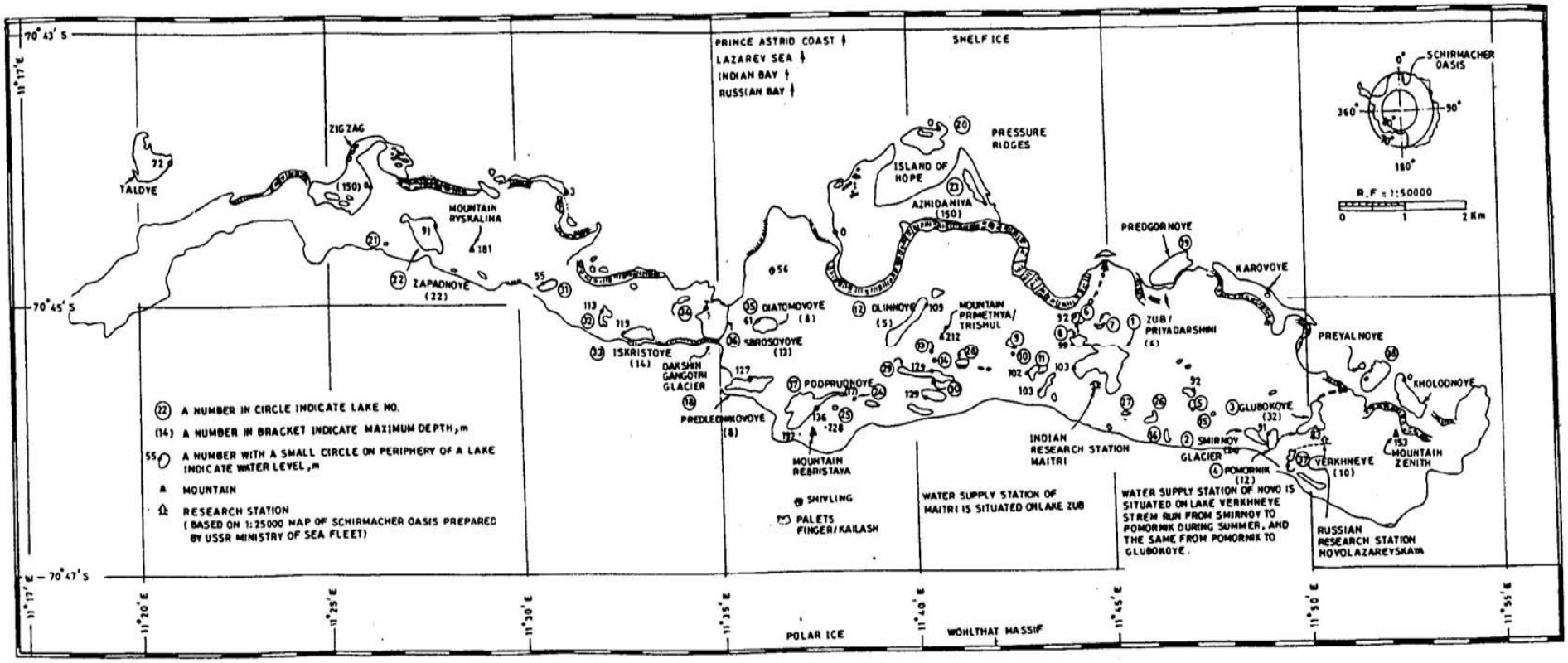


FIG. 1 STUDY AREA SHOWING THE LAKES SURVEYED IN SCHIRMACHER OASIS, ANTARCTICA

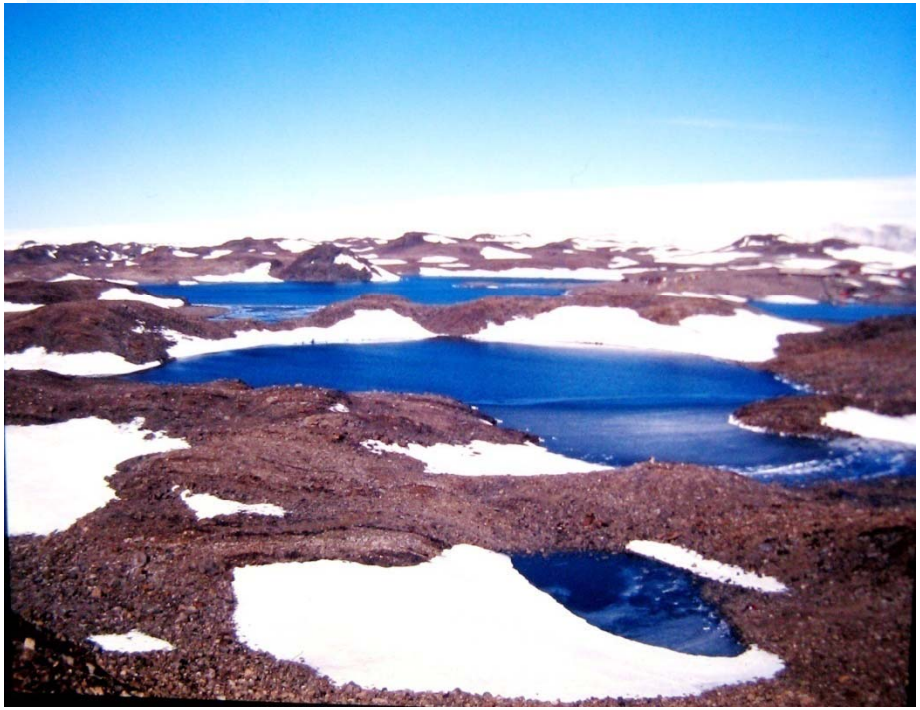
Classification of Lakes:

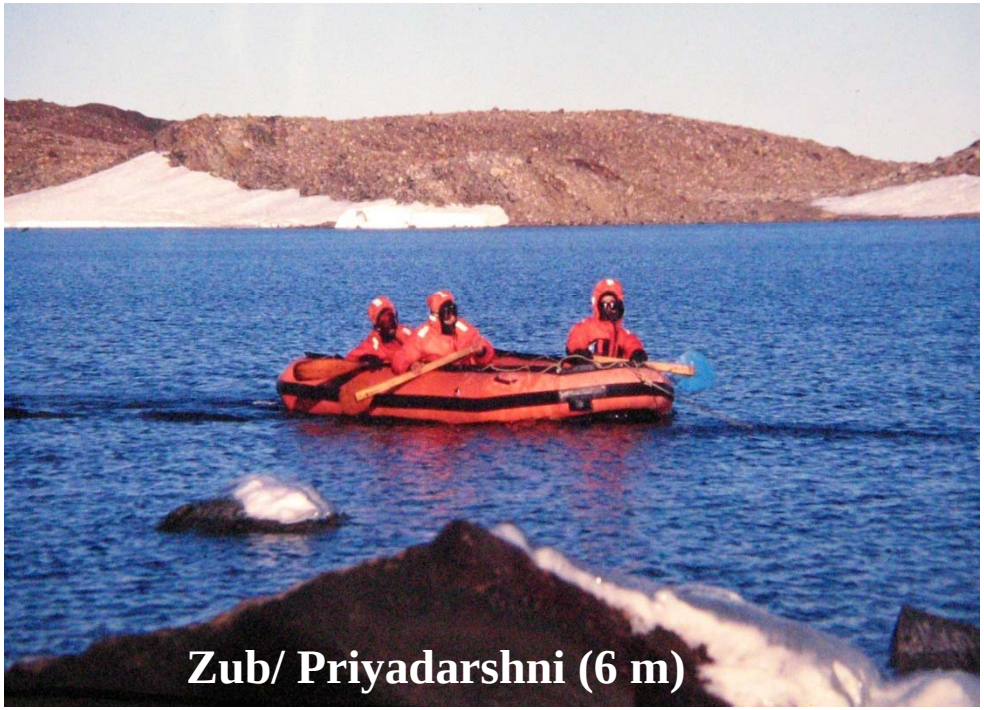
-Glacier-fed/Glacier-fed intermountainous

-Intermountainous

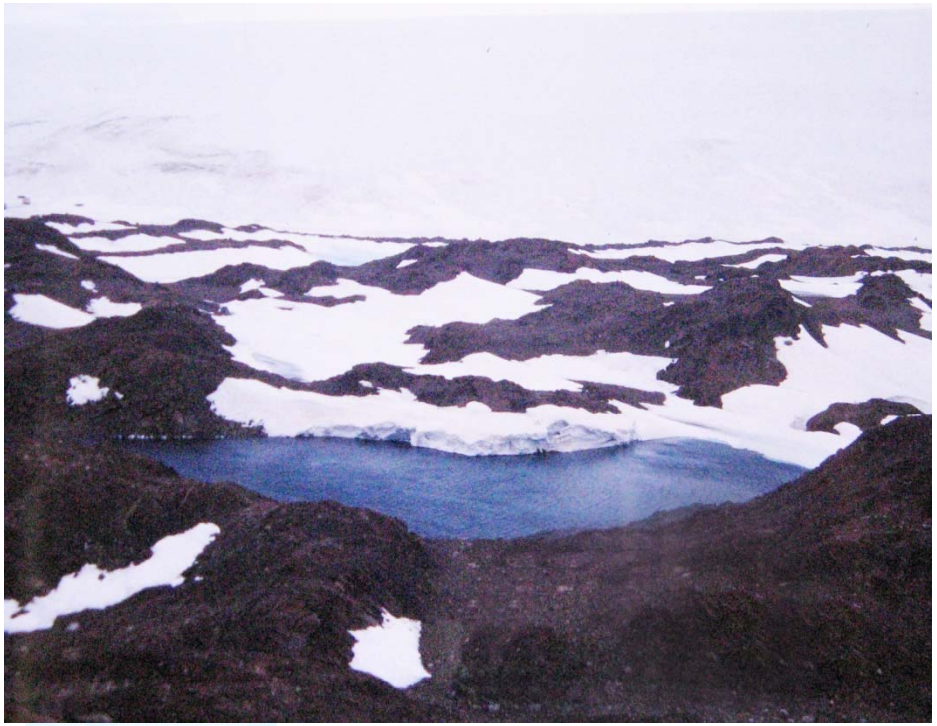
-Grounding line

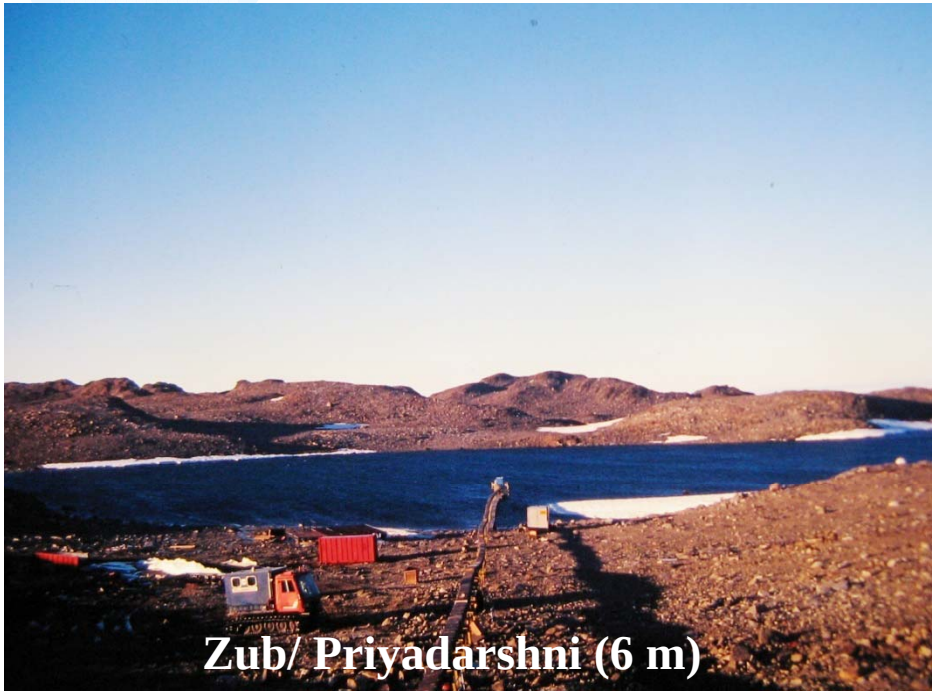

Glubokoye(36 m)





Zub/ Priyadarshni (6 m)

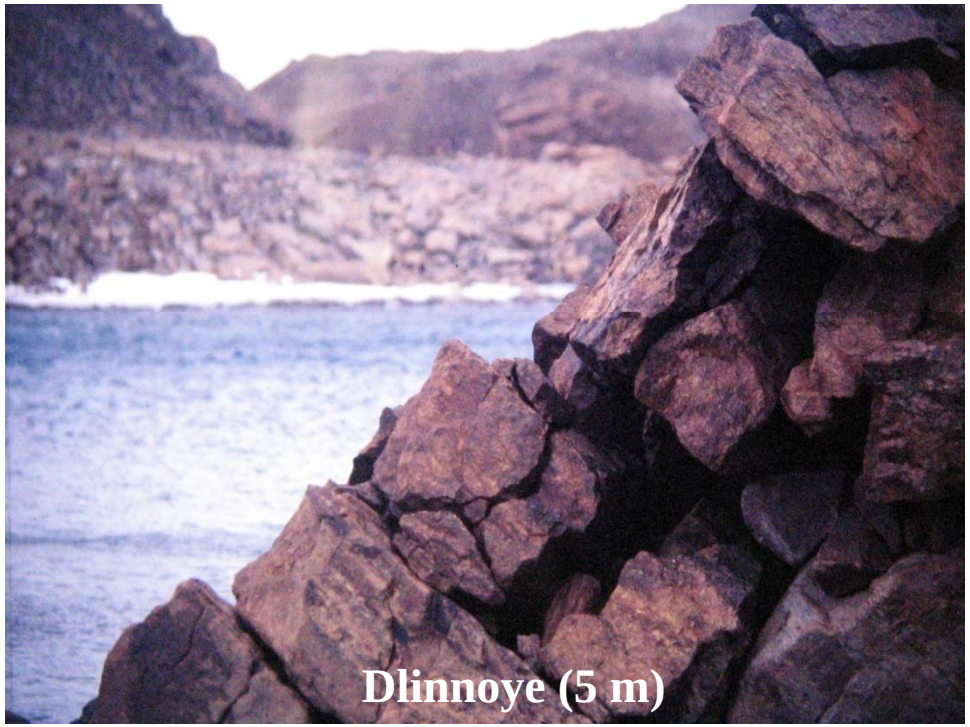


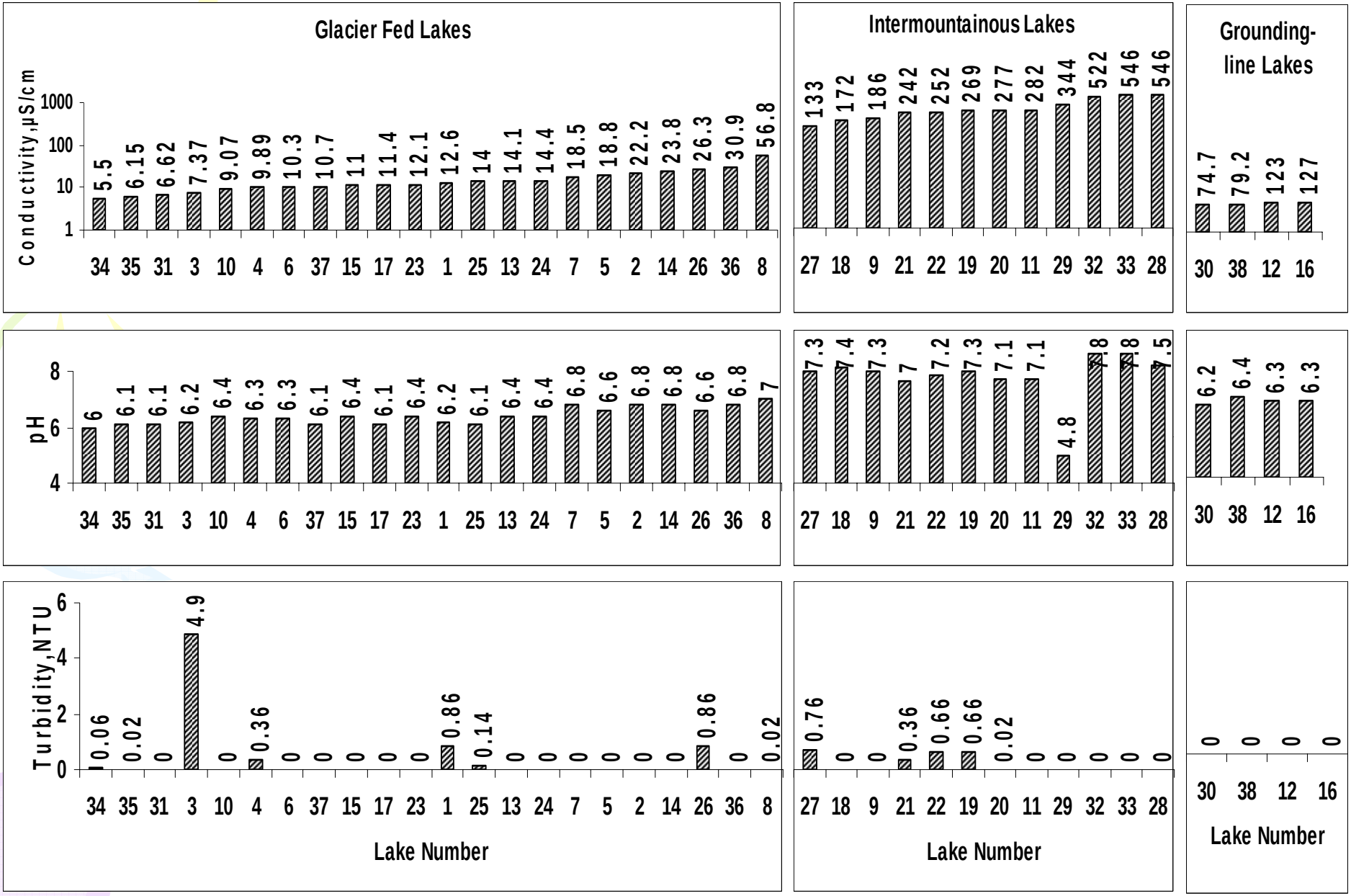


Zub/ Priyadarshni (6 m)


Sbrosovoye (13 m)


Smirnov (24 m)


Dlinnoye (5 m)



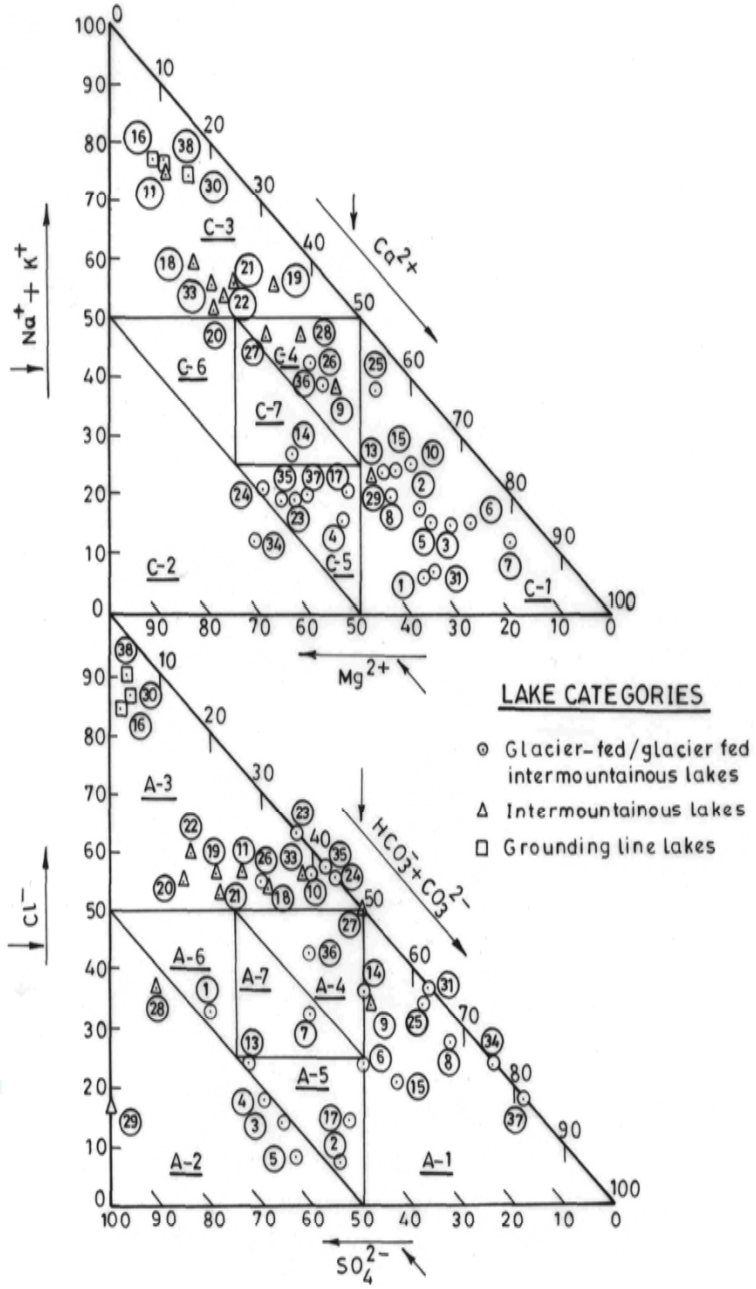
Some of the physical-chemical characteristics of Schirmacher Lakes

Glacier-fed		Glacier-fed Intermountainous	
Smirnov ↓	5.5 μS/cm ↓	Zub ↓	14 μS/cm ↓
Pomornik ↓	6.15μS/cm ↓	24 ↓	14.4μS/cm ↓
Glubokoye	10.7μS/cm	26	26.3μS/cm

Stone net, Sorted/ Stone/ Frost Polygon, Polygonal Ground/ Soil

Criteria for Classification of Lake Waters Based on Major Cations and Anions

Sub-fields : Dominant Ions	Criteria
Cation triangle	
C1:Calcium	Ca^{2+} > 50%
C2:Magnesium	Mg^{2+} > 50%
C3:Sodium	Na^{+} > 50%
C4:Sodium-Calcium	Na^{+} & Ca^{2+} each 25-50%, Mg^{2+} < 25%
C5:Calcium Magnesium	Ca^{2+} & Mg^{2+} each 25-50%, Na^{+} < 25%
C6:Sodium Magnesium	Na^{+} & Mg^{2+} each 25-50%, Ca^{2+} < 25%
C7:Calcium Magnesium Sodium	Ca^{2+}, Mg^{2+} & Na^{+} each 25-50%
Anion Triangle	
A1:Bicarbonate	HCO_3^- > 50%
A2:Sulphate	SO_4^{2-} > 50%
A3:Chloride	Cl^- > 50%
A4:Chloride-Bicarbonate	Cl^- & HCO_3^- each 25-50%, SO_4^{2-} < 25%
A5:Bicarbonate-Sulphate	HCO_3^- & SO_4^{2-} each 25-50%, Cl^- < 25%
A6:Chloride Sulphate	Cl^- & SO_4^{2-} each 25-50%, HCO_3^- < 25%
A7:Bicarbonate-sulphate chloride	HCO_3^-, SO_4^{2-} & Cl^- each 25-50%



Major Ion Chemistry of 38 Lake Waters from Schirmacher Oasis Represented in the form of Trilinear Cation-Anion

16 Water Types

Water Types
Ca^{2+} - HCO_3^-
Mg^{2+} - HCO_3^-
Ca^{2+} - SO_4^{2-}
Ca^{2+}- Mg^{2+} - Cl^-
Ca^{2+} - Cl^-
Ca^{2+} - Mg^{2+} - SO_4^{2-}
Ca^{2+}-Mg^{2+}-HCO_3^--SO_4^{2-}
Ca^{2+} - $SO_4^{2-}$$Cl^-$
Ca^{+2}-$HCO_3^-$$SO_4^{2-}$
Ca^{2+}-HCO_3^- - $SO_4^{2-}$$Cl^-$
Ca^{2+}-Mg^{2+}-Na^+-HCO_3^-
Ca^{2+}-Na^+-Cl^-
Ca^{2+}-Na^+-HCO_3^- - Cl^-
Na^+ - Cl^-
Ca^{2+} - Na^+ - SO_4^{2-}
Na^+ - Ca^{2+} - HCO_3^-

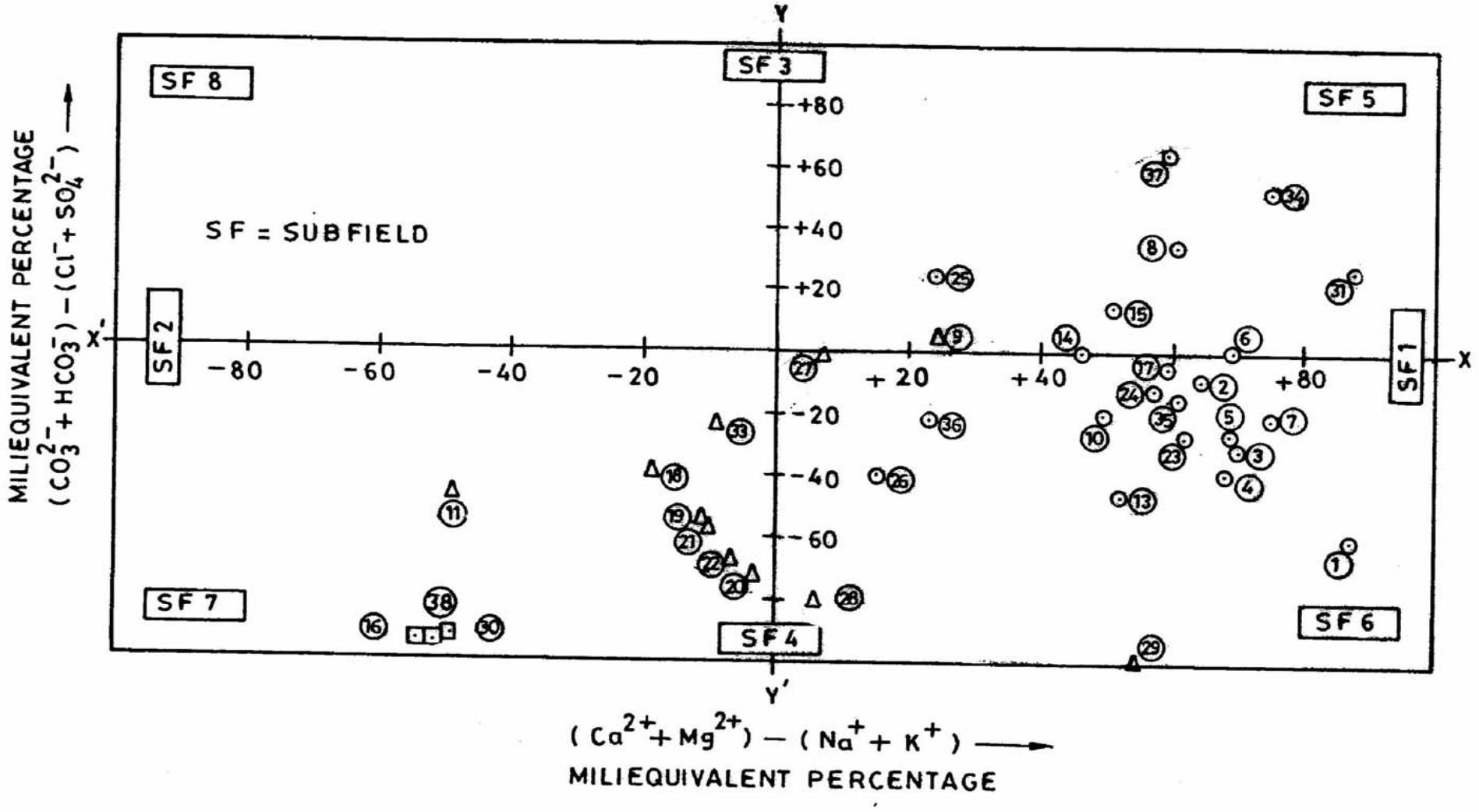


Fig. 4 Rectangular Ionic Field Describing the Overall Character of 38 Lake Waters from Schirmacher Oasis, Antarctica

Water Quality of Schirmacher Lakes : Summary of Results

Parameters	Schirmacher Lakes		
	Glacier-fed	Intermountainous	Grounding line
Conductivity, μS/cm at 25°C	5.5 – 56.8	133-546	74.7-127
pH	6-7	4.8-7.8	6.2-6.4
Turbidity, NTU	ND-4.90	ND-0.76	ND
Total ions, meq/L	0.102-0.994	2.55-10.6	1.20-2.14
Dominant cation	Ca^{2+}	Na^{+}	Na^{+}
Dominant anion	HCO_3^{-}	Cl^{-}	Cl^{-}
Dominant water type	Ca^{2+}-HCO_3^{-}	Na^{+}-Cl^{-}	Na^{+}-Cl^{-}
Dominant water character	$Ca^{2+}+Mg^{2+}>Na^{+}+K^{+}$	$Na^{+}+K^{+}>Ca^{2+}+Mg^{2+}$	$Na^{+}+K^{+} > Ca^{2+}+Mg^{2+}$
	$Cl^{-}+SO_4^{2} > HCO_3^{-}+CO_3^{2-}$	$SO_4^{2-}+Cl^{-} > HCO_3^{-}+CO_3^{2-}$	$SO_4^{2-}+Cl^{-} > HCO_3^{-}+CO_3^{2-}$
	$NCH^{*} > CH^{*}$	NCH > CH	NCH > CH

Every natural water has its own unique characteristics

THANK YOU