

Use of liquid anti-icing to reduce chloride inputs to the environment from the winter maintenance of parking lots

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Masters research

CVC/Peel/TRCA salt workshop

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Introduction

- ▶ Chloride on the rise to harmful levels because of road salt
 - ▶ Impacts entire ecosystem
- ▶ Mostly NaCl
 - ▶ Also MgCl, CaCl
- ▶ Up to 50 % of salt applied is to parking lots
 - ▶ No regulation or guidance
 - ▶ Incentives for over-application
- ▶ Canada: Code of Practice
- ▶ BMPs exist

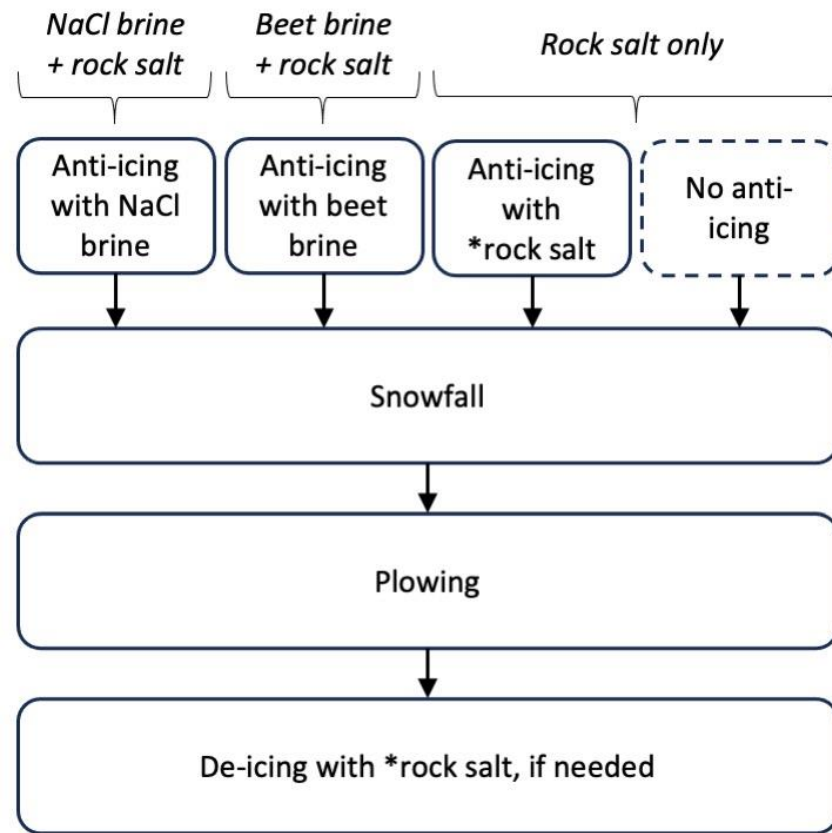
Liquids and anti-icing

- ▶ Salt dissolved in water
 - ▶ Starts working faster
 - ▶ Better coverage
 - ▶ Less chloride
- ▶ Anti-icing
 - ▶ Pro-active
 - ▶ Prevents bonding with pavement
- ▶ Agricultural by-products
 - ▶ Beet, corn, cheese
 - ▶ Lower freezing point
 - ▶ Sticks to surface



Research Questions

1. Does the use of liquids for anti-icing reduce chloride inputs to parking lots during winter maintenance compared to the use of rock salt alone?
2. Does the addition of an agricultural byproduct (i.e., beet juice) to a liquid anti-icer reduce the chloride input to parking lots during winter maintenance?



* All rock salt is pre-treated with beet juice product

Study Design

Year	19/20	20/21	21/22
<u>Grp. A</u>	Beet brine	Beet brine	Beet brine
<u>Grp. B</u>	NaCl brine	Rock salt	NaCl brine
<u>Grp. C</u>	Rock salt	NaCl brine	Rock salt



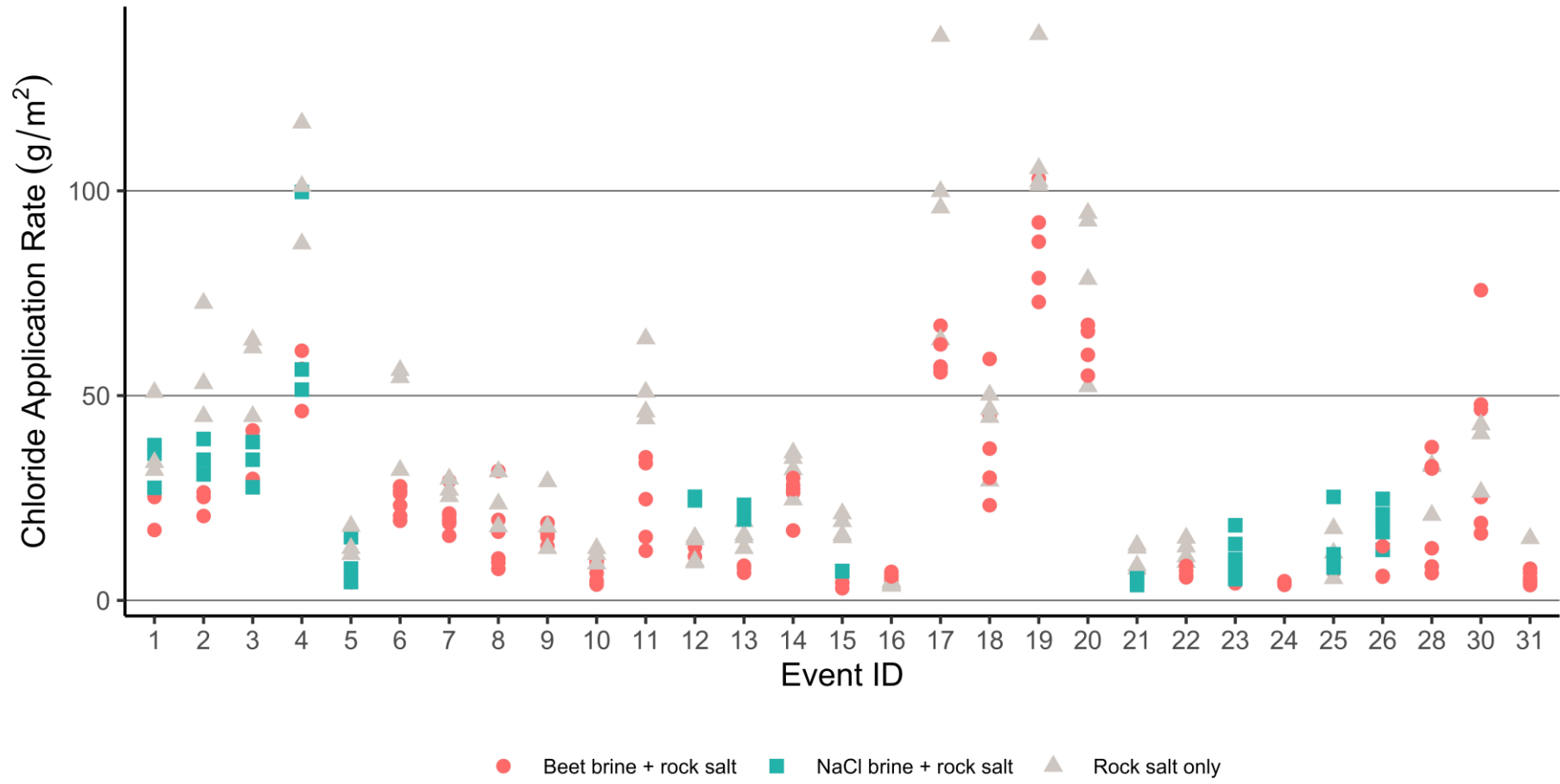
- Group A Parking Lots
- Group B Parking Lots
- Group C Parking Lots



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Results

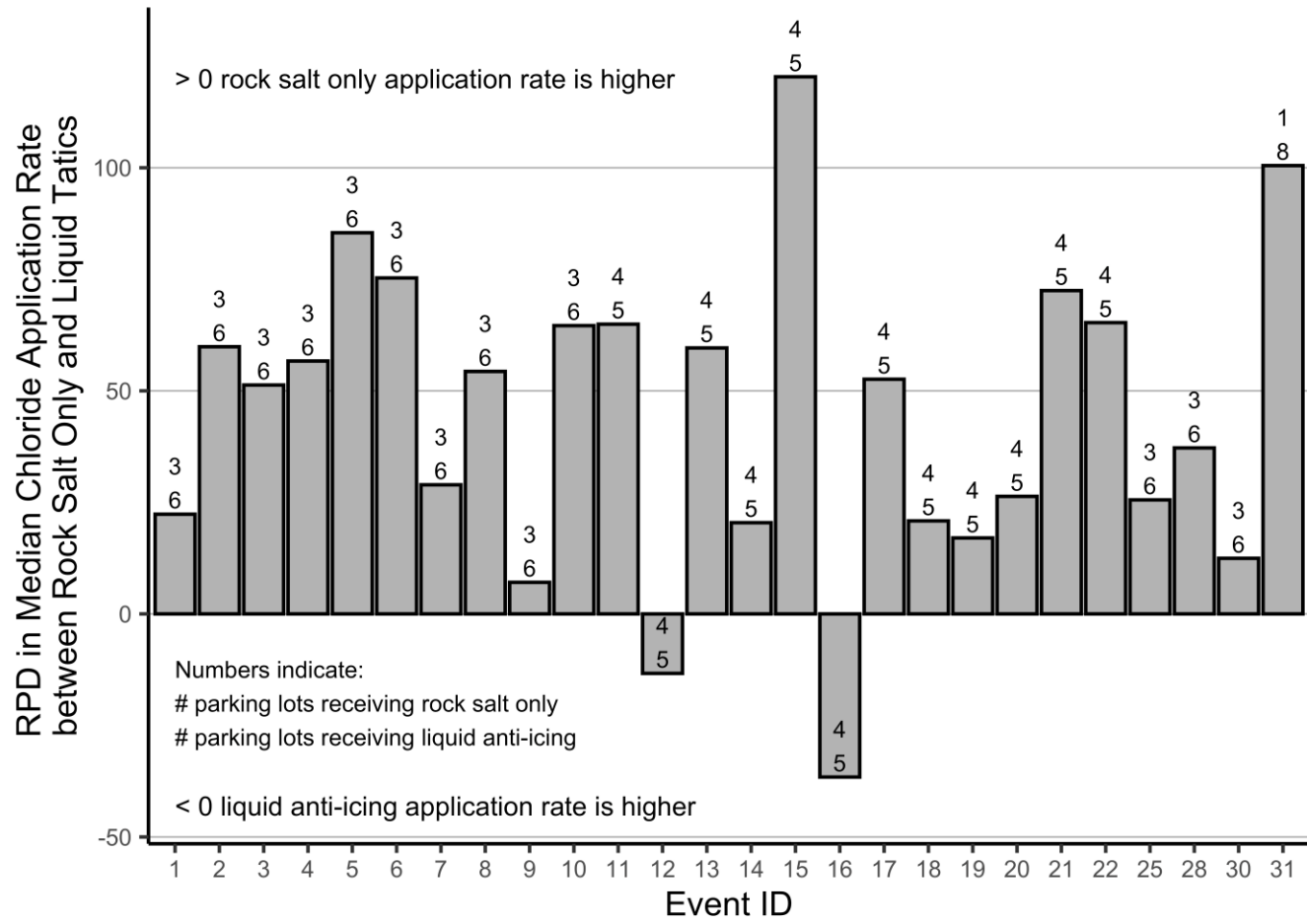
28 events over 3 years

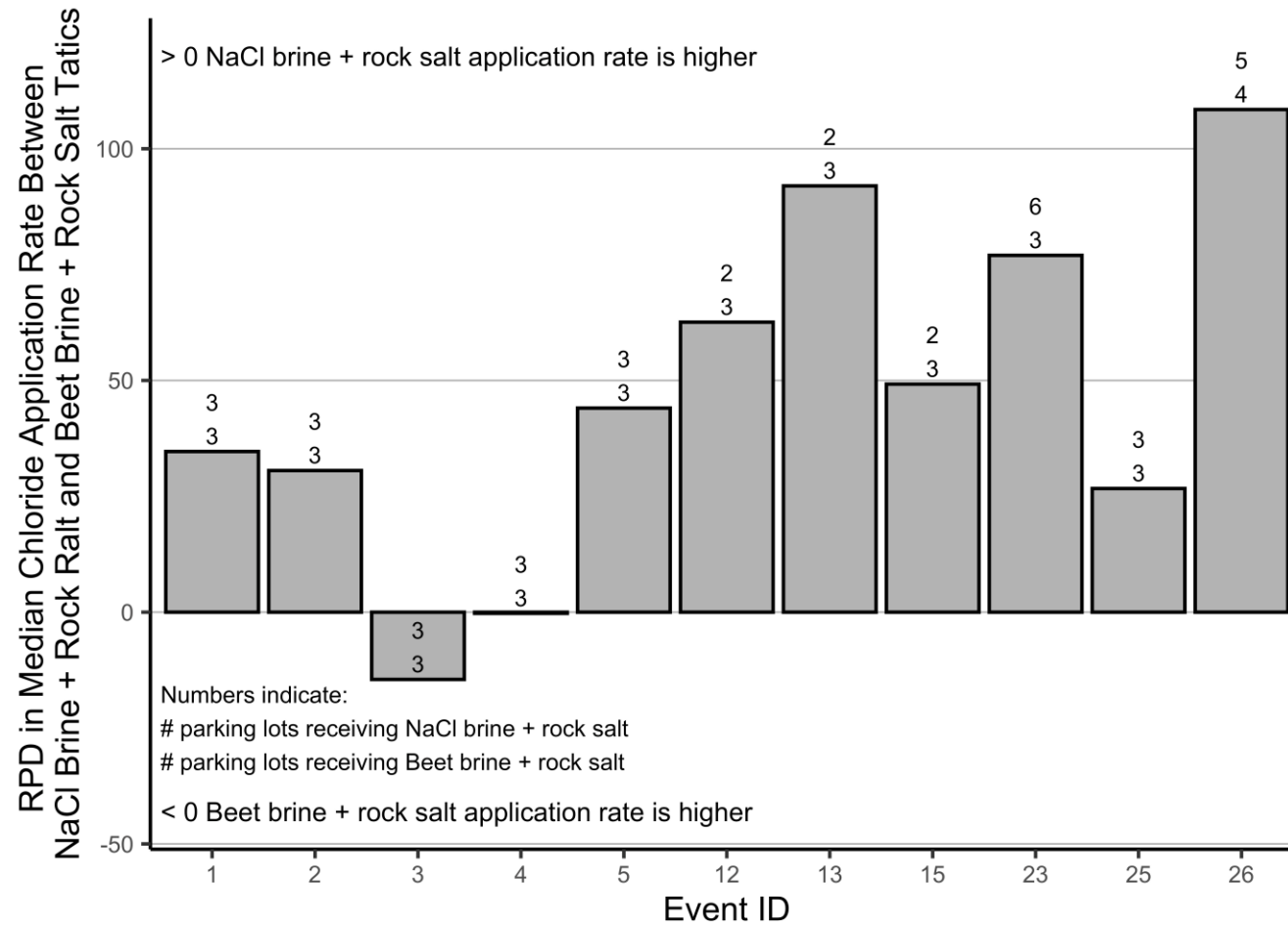


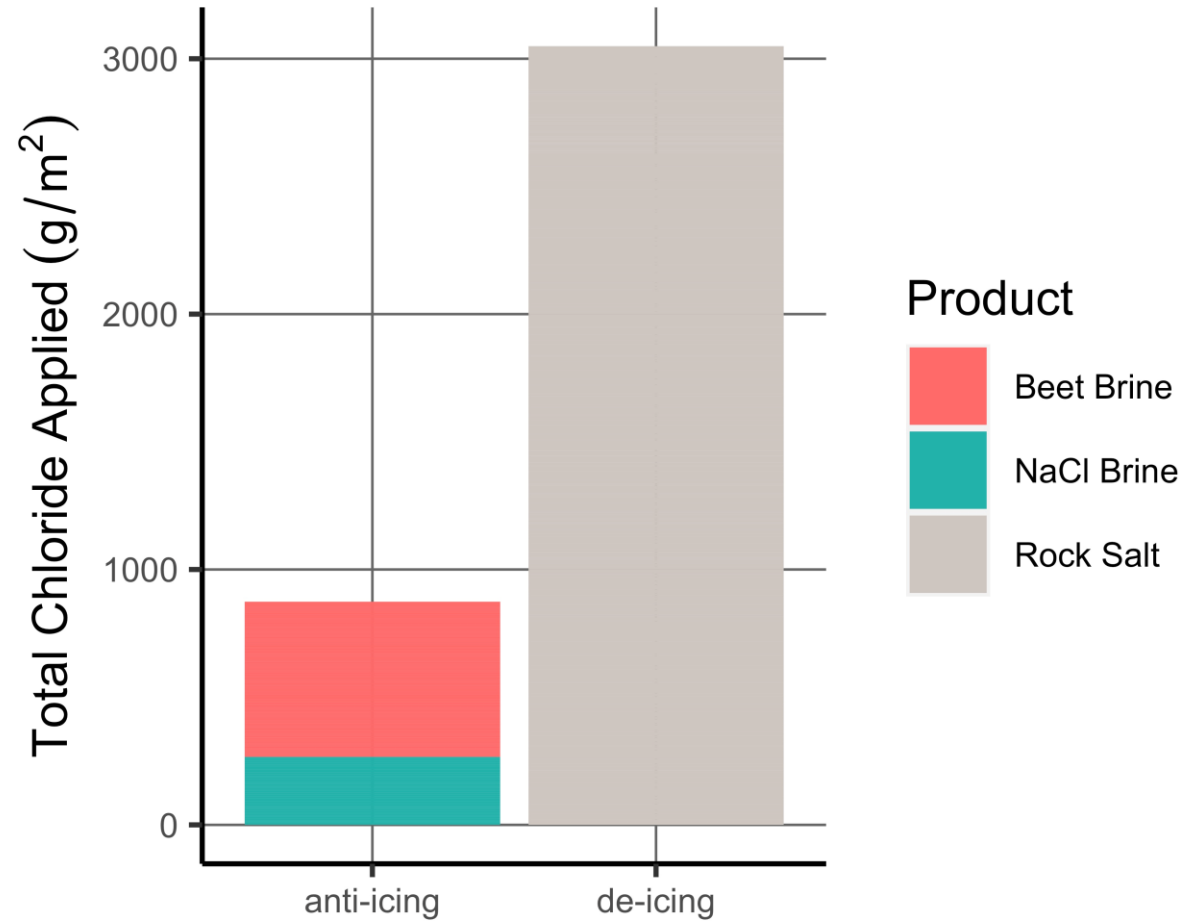
Management Factors

- ▶ Client complaints
- ▶ Weather forecast uncertainty
- ▶ Residual material
- ▶ Equipment availability
- ▶ Staff training and availability
- ▶ Material procurement









Implications

- ▶ 6.4 % of variance explained by tactic, however within events:
 - ▶ Liquid anti-icing: on average 31 % chloride savings over rock salt only
 - ▶ Beet juice: on average 32 % chloride savings over NaCl brine
- ▶ Beet juice environmental impacts
 - ▶ Trade-off beet juice: chloride
- ▶ Liquid anti-icing is feasible solution for industry right now
- ▶ Cost savings from purchasing less salt
- ▶ Future guidelines

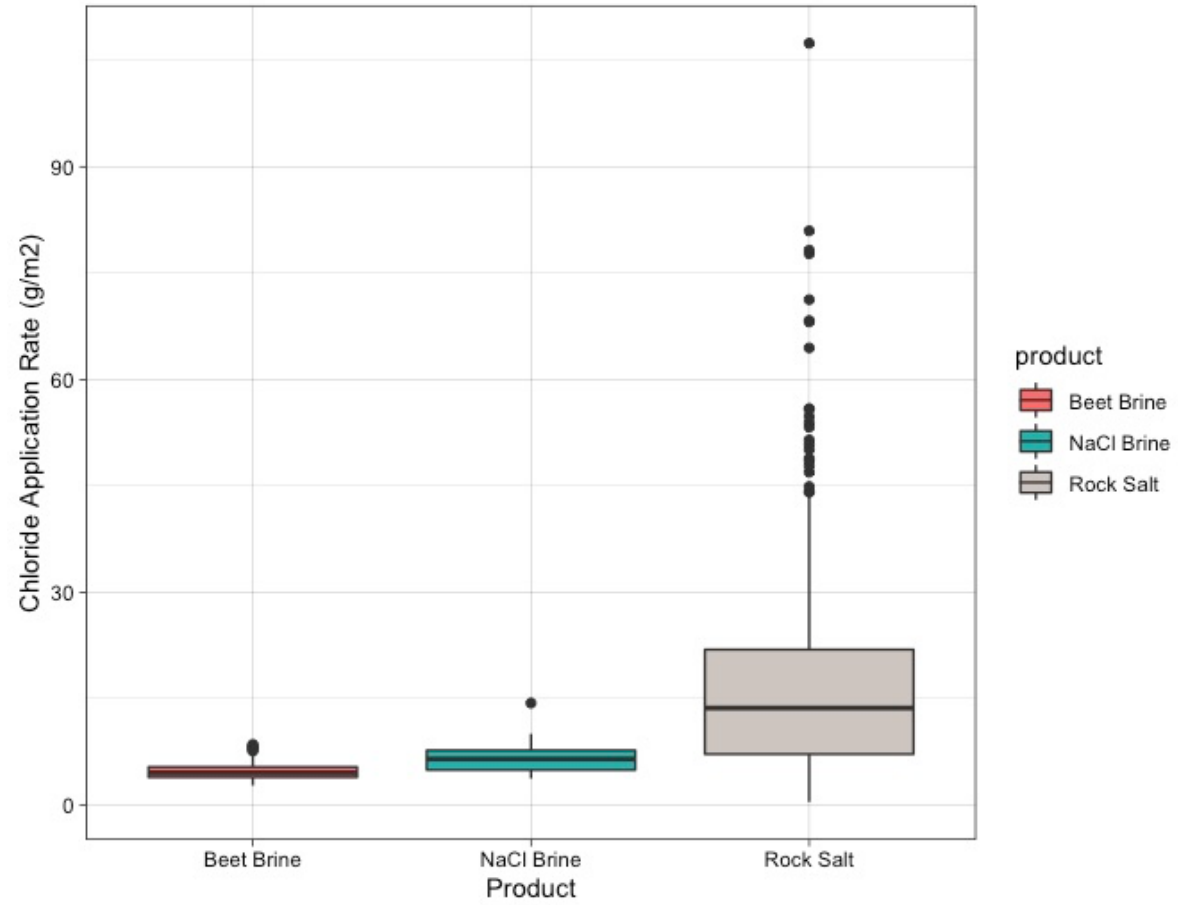


Questions?

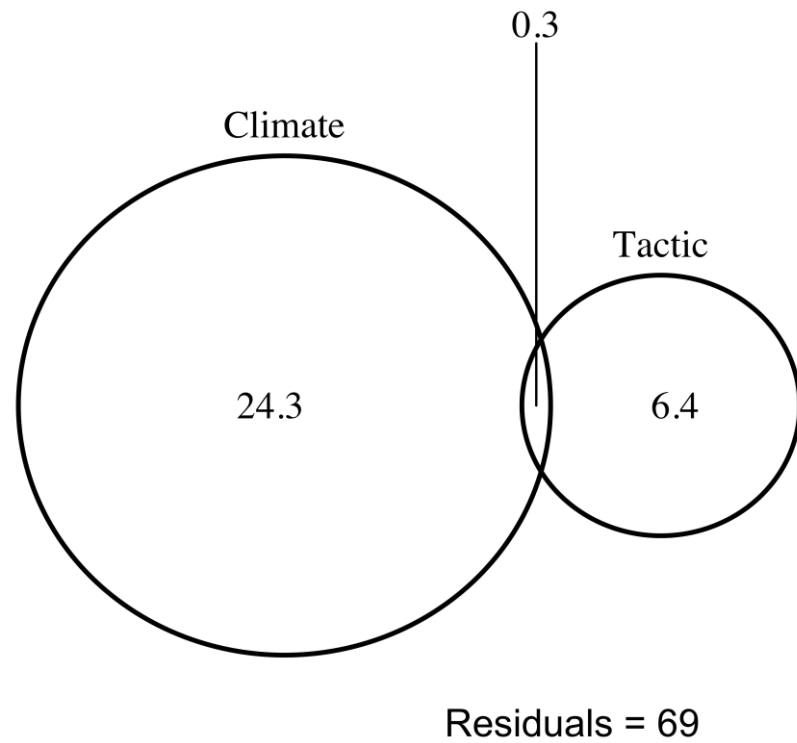
Thank-you!



Chloride Application Rate by Product



RQ 1



- ▶ Percent of variance explained by weather/climate variables and tactic
- ▶ weather variables:
 - ▶ Min and max temperature
 - ▶ Total precipitation
 - ▶ Total snowfall
 - ▶ Maximum wind gust
- ▶ Only 6.4 % explained by tactic