Extreme Precipitation Study

Capital Planning Committee - December 12, 2022

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Why did we do this study?

- Concern over what future extreme storms could look in the Bay Area
- Need to be better prepared for future storms
- Need to include future precipitation data into long-range planning and design
- Desire to be industry leaders

'Bomb cyclone' lashes California, causes flooding

236K views · Oct 25, 2021
YouTube › Reuters

Northern California hit by bomb cyclone and atmospheric river

169K views · Oct 24, 2021
YouTube › ABC10

Bomb Cyclone, Atmospheric River Lash Northern California

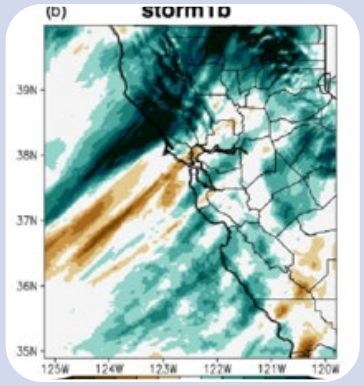
50 views · Oct 26, 2021
YouTube › News On 6/KOTV

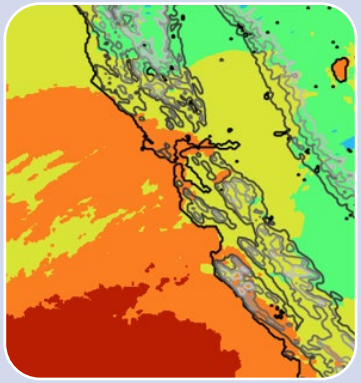
Weather Extra: Atmospheric Rivers & Bomb Cyclones

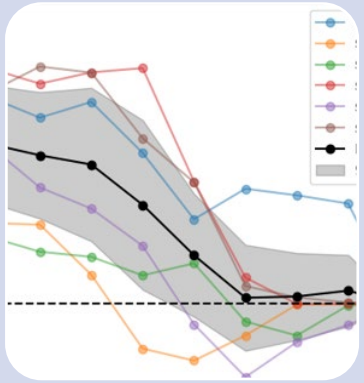
4K views · Oct 25, 2021
YouTube › KPIX CBS SF Bay Area

Look How Far We Have Come

Year	Storm Dates	
	Storm Start	Storm End
2014	12/2/2014	12/6/2014
2014	12/11/2014	12/12/2014
1982	1/3/1982	1/5/1982
1994	11/4/1994	11/7/1994
1998	1/31/1998	2/8/1998
1995	12/10/1995	12/13/1995







Storm Selection — DONE

Historic Storm Modeling — DONE

Future Condition Storm Modeling — DONE

Data Analysis — DONE

Deliverable: Guidebook (Vol 1) — DRAFT

Deliverable: Data and Tools (Vol 2) — In Process

Part 1: Extreme Storms

Identified 15 extreme storms that impacted the 3 agencies

1. Atmospheric Rivers (AR) – 2 events (13% of storms)
2. Extratropical Cyclones (ETC) – 3 events (20% of storms)
3. **AR + ETC** – 10 events (67% of storms; most common extreme storm)

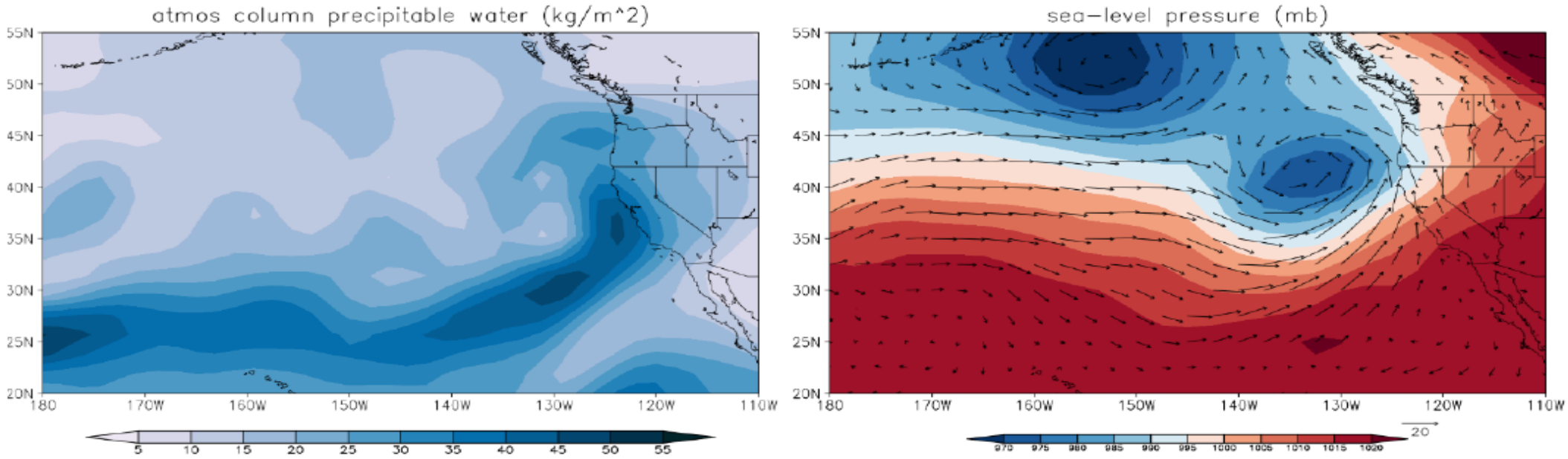


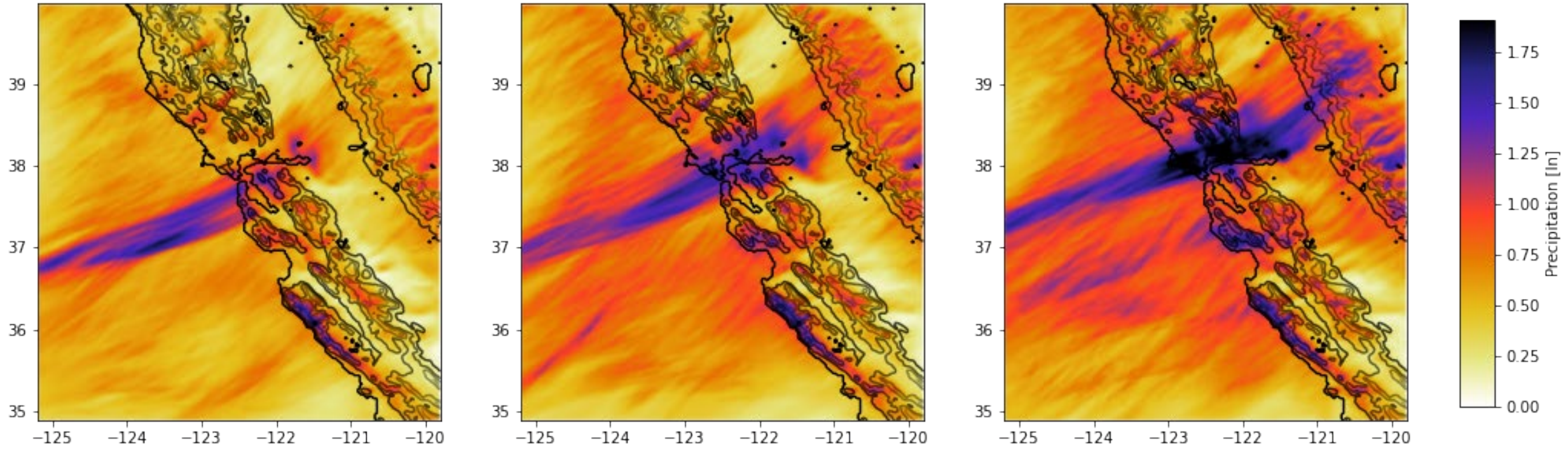
Figure 1 - Atmospheric River and Cyclone Occurring on December 12, 1995

Key Finding: More rain expected with extreme storms

Most Common Extreme Storm	2050	2100
Atmospheric River + Extratropical Cyclone **(67% of largest storms since 1980 are these combinations)**	**Up to +17%**	**Up to +37%**

Key Finding: Increased intensity; more rain in shorter duration

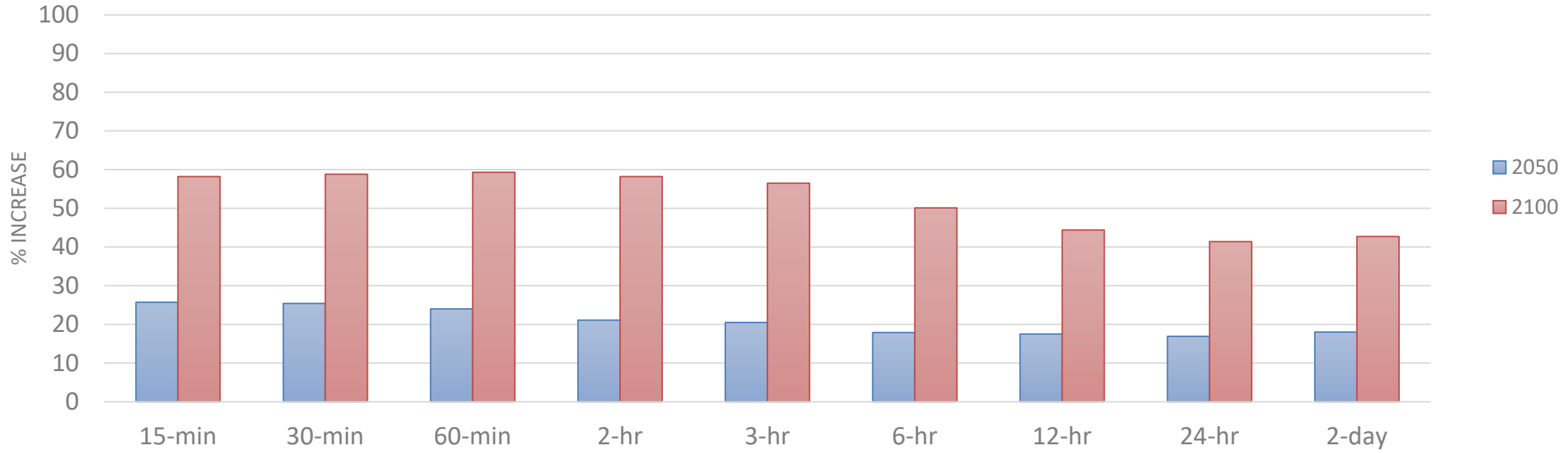
1995 Storm **2050** **2100**



Part 2: Smaller Storms

Analyzed smaller, more frequent storms

1. **5-Year Return Period (PUC system)**
2. **100-Year Return Period (City Streets)**



Key Finding: Even bigger increase for smaller storms

Changes in 5-year Return Period

2050

+ 17% for 24-hour duration

+ 21% for 3-hour duration

(+17% for Extreme Storms)

2100

+ 41% for 24-hour duration

+ 57% for 3-hour duration

(+37% for Extreme Storms)

Changes in 100-year Return Period

2050

+ 22% for 24-hour duration

+ 26% for 3-hour duration

(+17% for Extreme Storms)

2100

+ 51% for 24-hour duration

+ 67% for 3-hour duration

(+37% for Extreme Storms)

Key Takeaways

- Extreme storms will drop more rain in a shorter period
- Smaller storms will increase even more than extreme storms
- SFPUC WWE system cannot manage these changes alone

High Level Recommendations

- Develop CCSF flood resiliency policy statement
- Integrate Results with other climate related data sets
- Expand department participation in Climate Resilience Program
- Refine decision making process
- Prioritize development of cross department climate change financial plan

Next Steps for Sponsor Agencies

Volume 1 – Draft Submittal	Nov 29, 2022
Capital Planning Committee Presentation	Dec 12, 2022
Volume 2 – Draft Submittal	Jan 12, 2023
Final Deliverables	Mar 10, 2023